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TIMBER DECAY—A SURVEY OF RECENT WORK*

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CONTENTS

1. INTRODUCTION
2. DESCRIPTION OF TREE AND TIMBER FUNGI
3. HEART ROT IN STANDING TREES
4. PHYSIOLOGY OF WOOD-ROTTING FUNGI
5. DECAY OF WOOD BY MICRO-FUNGI AND BACTERIA
6. INFLUENCE OF DECAY ON THE PHYSICAL AND CHEMICAL PROPERTIES OF WOOD
7. NATURAL DURABILITY OF WOOD
8. DECAY OF WOOD IN STORAGE AND TRANSPORT
9. DECAY OF WOOD IN USE
10. LABORATORY TESTING OF WOOD PRESERVATIVES

1. INTRODUCTION

Since 1944, when a review by Cartwright and Findlay of research work on timber decay carried out during the previous 15 years was published[1], research in this field has made much progress. During World War II, shortages of traditional timbers in many countries stimulated research on the alternative species available, and the enforced use of perishable species for military purposes required the development of methods for their preservation, especially in the tropical theatres of war. Since the end of the war, research on the prevention of deterioration of wood and other materials has continued actively. As compared with other natural raw materials the price of timber has remained consistently high, the price of many kinds being five to six times the pre-war level, and this has further stimulated interest in timber preservation.

The present review attempts to survey briefly the more important results of research on problems of timber decay which have become available since 1942. Its scope does not permit more than a passing reference to the important advances concurrently made in the related field of sap-stain and mould control.

The more important items of general literature on timber decay are commented on in the list below:

CARTWRIGHT, K. St. G., and FINDLAY, W. P. K. (1946). Decay of timber and its prevention. H.M. Stationery Office, London. pp. 294.	This brought together much information previously available only in separate bulletins. A Polish translation was published in 1951 in Warsaw.
MAHLKE-TROSCHEL [Revised by LIESE, J.] (1950). Handbuch der Holzkonservierung. Springer-Verlag, Berlin. pp. 571.	This was published as a 3rd edition but unfortunately Liese did not have full access to American literature of World War II.
GROENOU, H. B. van, RISCHEN, H. W. L., and BERGE, J. van der. (1951). Wood preservation during the last 50 years. A. W. Sijthoff, Leiden. pp. 318.	A very useful survey of literature of wood preservation, written in English.
JACQUIOT, C., and KELLER-VALLANT, C. (1951). La préservation des bois. Hermann et Cie, Paris, pp. 159.	A popular textbook on the preservation of wood.

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[1] *Forestry Abstracts* 5 (4), 1944 (217–28).

BAXTER, D. V. (1952). Pathology in forest practice. John Wiley & Sons, Inc., New York. 2nd ed. pp. 601.	One chapter is devoted to decay of timber and another to discolorations and stains in forest products.
MARTÍNEZ, J. B. (1952). Conservación de maderas en suo aspectos teórico industrial y económico. Instituto Forestal de Investigaciones y Experiencias, Madrid. pp. 550.	A comprehensive textbook on wood preservation, the first volume of which deals with oil-type preservatives. Among the numerous excellent illustrations are photographs of the principal wood-rotting fungi of Spanish Guinea.
FINDLAY, W. P. K. (1953). Dry rot and other timber troubles. Hutchinson's Scientific & Technical Publications, London. pp. 267.	A popular textbook describing the principal causes of deterioration of wood and means for their prevention.
PŘÍHODA, A. (1953). Houby a bakterie poškozující dřevo. [Fungi and bacteria injurious to wood.] *Lesn. Knihovna* (*malá Řada*) No. 26. pp. 267.	A well illustrated little book in Czech.
RECORDS OF THE BRITISH WOOD PRESERVING ASSOCIATION, LONDON (1951–54).	These contain a number of papers relating to various aspects of timber preservation. This Association has also published a number of popular leaflets on deterioration of timber and its prevention.
BECKER, G., and THEDEN, G. (1954, 1955). Annual report on wood protection 1952/53, 1953/54. Springer-Verlag, Berlin.	This publication, formerly prepared by Willy Kinberg, gives fairly full abstracts in English and German of the world literature on deterioration of wood by fungi, fire and insects, and its prevention.
PREVENTION OF DETERIORATION ABSTRACTS, WASHINGTON, D.C.	Contain abstracts of current literature on wood preservation.
FORESTRY ABSTRACTS, FARNHAM ROYAL, BUCKS.	Includes abstracts on all topics dealt with in this article.

2. DESCRIPTION OF TREE AND TIMBER FUNGI

Findlay (1950) in a presidential address to the British Mycological Society pointed out that the taxonomy of the Polyporaceae, to which most of the timber fungi belong, remains in an unsatisfactory state of flux. Some authors adhere to the old Friesian genera, which are in many respects artificial; other mycologists have proposed new generic sub-divisions of the family, using microscopic features of the anatomy of the fruit body in place of the grosser morphological features. While these essays aim at a more natural classification of the family, the premature application of these ideas in floras leads to a multiplicity of generic names, confusing anyone who is not a specialist in the group and adding to the difficulties of abstractors and indexers. For instance the common fungus *Polyporus betulinus* may be found under *Ungulina* in one flora and under *Piptoporus* in another; and *Polyporus schweinitzii* under *Phaeolus*, *Cladomeris*, *Hapalopilus* or *Coltricia*. Pending the general acceptance of the new generic groupings it is probably wiser for foresters and practical forest pathologists to use a rather conservative nomenclature.

Important works on the taxonomy of Polyporaceae, by Overholts (1953), Bondarcev (1953), Cunningham (1947–1950) and Pinto-Lopes (1952), have appeared during the period under review. Teixeira (1946, 1948) has contributed to our knowledge of South American Polyporaceae. Lowe (1952, '53, '55) has recently published studies of the perennial polypores of North America. A survey of recent attempts to reclassify the family has been published by Bridge Cooke (1949). Wood-inhabiting Thelephoraceae have been the subject of a series of papers in the *Canadian Journal of Botany* 1948–54 by Jackson, Nobles, McKeen, Maxwell and White. The Agaricaceae of Europe have been fully described in a magnificent monograph by Kuhner and Romagnese (1953), while Dennis (1950) has published papers on certain groups such as *Lentinus* for which he collected material in the tropics. The succession of micro-fungi that develop on fallen logs and branches has been studied by Chesters (1950), who lists and figures the common Pyrenomycetes growing on hardwoods in England.

An important study of wood-rotting fungi in culture has been published by Nobles (1948). Robak (1942) described in great detail the cultures and physiological requirements of seven important wood-rotting fungi in Norway. Baxter (various dates) continued his study of 'Some resupinate Polypores from the region of the Great Lakes', including descriptions of cultures of many of the species. Griffioen (1949) studied the wood-rotting capacities of five common fungi in Indonesia and found that *Polystictus hirsutus* was the most active, causing losses in weight of over 80% in perishable woods such as *Aleurites*

moluccana. A well illustrated booklet on the wood-rotting fungi of Portugal was published by Pinto-Lopes (1950). He drew attention to the prevalence of *Trametes pini* on Pines and of *Phellinus torulosus* on Eucalyptus. On sleepers *Trametes* (*Lenzites*) *trabea* and *Trametes hispida* were found to be the most destructive species. For Pakistan, Khan (1954) has listed and described the principal wood-rotting fungi and recorded the hosts on which they occur.

Diagnostic keys for the identification of rot fungi in culture have been presented in various forms by different workers. Baxter tabulated the characteristic features of the cultures and gave dichotomous keys. Nobles (1948) used a series of key patterns arranged in ascending numerical order for the diagnosis of the 126 species which she described. A perforated-card system (based on the Hollerith system) for recording descriptions of cultures in a form allowing their ready use for identification has been developed by Findlay at Princes Risborough (*Progr. Rep. For. Prod. Res., Lond. 1954*) and a similar method is in use at the Division of Forest Products at Melbourne. Cartwright (1939) and Heim (1947) have pointed out the value of cultural studies for the solution of problems in taxonomy.

Following the recommendations of the Commonwealth Scientific Conference, 1946, a committee was set up to make a survey of existing collections of micro-organisms in culture and to advise generally about their scope. As a result of its activities a directory of culture collections in the United Kingdom and a list of the species maintained in the U.K. and Crown Colonies has been published (1951). Catalogues of the collections of fungi maintained in Great Britain and the Dominions have also been published, so it is now easy for a research worker requiring any particular culture to find out if it is available in any Commonwealth laboratory. The Muséum National d'Histoire Naturelle in Paris has also published catalogues of its collections of fungi and algae in culture; these include some useful notes on the technique for obtaining fructifications of higher fungi and on the prevention of deterioration of materials under tropical conditions.

3. HEART ROT IN STANDING TREES

Although diseases of standing trees do not fall within the scope of this review, it would be incomplete without some reference to recent work on the development of heart rots that affect standing timber. As an excellent review of our knowledge of heart rots of living trees has recently been published by Wagener and Davidson (1954), reference here is confined to certain lines of work that have received particular attention. In Europe butt rot caused by *Fomes annosus* in conifers has continued to be the subject of much research. Rennerfelt (1946) gave a full account of its occurrence in Sweden. Rishbeth (1950, 1951, 1952), who studied the dying of young Scots and Corsican Pines in East Anglia, observed that on former arable or heath sites the disease appears chiefly after thinning, and he was able to show that the stumps left become infected by spores and the fungus then passes from the stump roots through root connections to healthy trees near by. He found little evidence that the fungus could live freely in the soil, so that the soil pH is unlikely to have a *direct* effect on its spread. He suggested that the spread of infection could be greatly reduced by covering the stumps with a mixture of tar and creosote. He found that there is some biological control of stump infection by fungi such as *Peniophora gigantea* and *Trichoderma*, but a practical method of encouraging the colonization of stumps by harmless saprophytic fungi has not yet been developed.

Jørgensen and Petersen (1951) similarly found *F. annosus* to be prevalent in thinned, but absent from unthinned stands. Henriksen and Jørgensen (1953) showed that the extent and severity of attack on Spruce increased with increased severity of thinning; they found little or no attack when only dead trees had been removed. Rennerfelt (1952), however, reported that though attack generally originated in stumps after felling, affected trees could be found in untouched stands. Hepting and Downs (1944), finding *F. annosus* to be the principal cause of butt rot in *Pinus strobus*, suggested that the higher proportion of butt rot is thinned stands might be due to a build-up of the fungus in the stumps left by previous thinnings. Generally the most severe damage was found to occur on light sandy soils in dry areas. In Deodar forests Bagchee (1952) found *F. annosus* to be particularly troublesome in badly drained soils and in deep gullies where snow persists.

The most significant discovery in recent studies of butt rot caused by *F. annosus* is the relationship between thinning and the spread of infection, and there are grounds for hoping that treatment of the stumps with a fungicide may materially reduce the spread of the disease in coniferous plantations.

The present state of knowledge about the *Fomes annosus* problem is well summarized in the report of a meeting of the principal workers on the subject, held at Wageningen in 1954 (Section 24 of the International Union of Forest Research Organizations).

In Canada the study of heart rots has been greatly facilitated by field isolation in pure culture of the causal fungi. Formerly the cause of the rot could be ascertained only if sporophores ('conks') of the

fungi were found associated with the rot. It often happens that decay of the same type and appearance can be brought about by several different fungi which may differ in their biology, so that if only one of the causal fungi forms conspicuous sporophores, all the decay may be ascribed to this one species. For instance most of the white ring rot affecting Western Red Cedar (*Thuja plicata*) in British Columbia used to be attributed to *Poria weirii*; only after many isolations of the causal fungi did it come to be realized that a number of other fungi are involved and that the actual cause of white ring rot of Cedar in coastal regions is *P. albipellucida;* only in the interior is major damage caused by *P. weirii* (Buckland 1946).

Before surveys of this kind can be carried out successfully, much preliminary work must be done in order that the fungi isolated from the diseased trees can be identified in the absence of any fructification either on the tree or in pure culture. This involves the collection and identification of the major timber-rotting fungi of the region and the preparation of pure cultures from the sporophores; methods for classifying and quick recognition of these fungi in culture have then to be worked out. A certain proportion of the fungi isolated from diseased trees will inevitably fail to correspond with any of the standard cultures and may have to remain unidentified until they can be induced to fructify. Nobles (1948) published a key to the identification in culture of 126 species of wood-rotting fungi which she had studied and illustrated in detail. Her work has been of fundamental value and has greatly facilitated the study of heart rots in the Canadian forests. Similar work is being undertaken in Australia and is obviously desirable elsewhere.

Methods for estimating the volume of decayed timber (cull volume) in a stand have been worked out which, though hardly applicable to single trees, give tolerably accurate figures for whole stands. These methods make use of such indications as scars that provide points of entry for the parasite and of positive evidence such as sporophores, swollen tree bases and resin flow. Further, by measurement of the actual volume of decayed wood in sample logs at the time of felling, reasonably accurate estimates can be made of both present and future losses due to decay in a stand. Only in the U.S.A. have comprehensive estimates been prepared of losses due to heart rot in the principal timber species, but figures for the loss in merchantable volume of various species have been prepared locally in Europe. For instance Rattsjö and Rennerfelt (1955) estimated that butt rot caused mainly by *Fomes annosus* in sample plots of Spruce resulted in an average loss of about 23% of the value of the crop. Work of this kind is urgently needed in some less developed regions where decay in over-mature stands may exceed the annual growth. In many regions we still know little or nothing about the extent to which some of the major tree species are affected by heart rot or by what is equally important in more tropical species, brittle heart. Bagchee (1952) reviewed the progres of work in India during the previous 20 years on native tree and timber diseases and their control. In Kenya investigations have been started into the causes of heart rot in the plantations of exotic species of *Cupressus*. The rot appears often to gain entry into the trunks through deep longitudinal cracks in the stem, the development of which may be related to violent changes in the water supply to the trees. Findlay (1954), in a report to the Eighth International Botanical Congress, pointed out how fragmentary is our knowledge of the heart rots that attack tropical timber trees, and emphasized the need for a systematic study of the Polyporaceae and other higher fungi responsible for decay in trees and timber in the tropics, with a view to the publication of regional floras to aid local research workers in identification. The building up of collections of standard cultures prepared from properly authenticated sporophores is another essential prerequisite for progress in the study of heart rots.

4. PHYSIOLOGY OF WOOD-ROTTING FUNGI

Many papers on various aspects of the physiology of wood-rotting fungi have been published during the period under review, but our knowledge of the fundamental processes involved in breaking down ligno-cellulose remains incomplete. In spite of an increase in our understanding of the mechanism of degradation of cellulose, we still know very little about the way in which the lignin in wood is broken down and of the nature of the enzymes involved and the way in which they operate.

(A) NUTRITION

Exhaustive investigations into various aspects of the physiology of wood-rotting fungi involving experiments with thousands of cultures, have been carried out on behalf of the U.S. Office of Naval Research by M. W. Jennison *et al.* (1955). Though many points of interest have emerged during the course of this work, the conclusions have only a limited bearing on the behaviour of these fungi *in wood*, since they relate to observations made on fungi grown on synthetic media in liquid 'shake' cultures. The work of this group began with a study of a wide range of N sources. Serial sub-culturing on each of the media was continued so as to avoid any possible carry-forward of nutrients in the inocula.

Under the conditions of these experiments, neither nitrate nor nitrite sources of N supported growth of any of the organisms. NH_4Cl was also unsuitable for continued growth of any species except *Trametes serialis*, unless succinic acid was present. Growth was obtained with a wide range of amino acids in their natural (*l*) form as the N source. Jennison is now investigating the nutritive value of wood-rotting fungi grown in culture.

Gottlieb *et al.* (1950), in studies of the biological degradation of lignin, were able to cultivate *Poria subacida* and *Polyporus* (*Polystictus*) *abietinus* on media in which lignin was the limiting source of C, after a process of adaptation in which the fungi were grown on media containing mixtures of lignin and glucose, the amounts of the latter being progressively decreased until the fungus was growing on lignin alone. Gottlieb and Pelczar (1951) have published a review on microbiological aspects of lignin degradation.

(B) ENZYMES

Intensive research on the biological degradation of cellulose has been carried out in the U.S.A. and our knowledge of the subject has been summarized by Siu (1951) and later by Siu and Reese (1953), who consider that more than one enzyme is involved in the breakdown of cellulose, a view challenged by Kooiman *et al.* (1953). Amorphous cellulose is more rapidly attacked than the crystalline. It is suggested that native cellulose is first converted by an enzyme (cellulase) into a linear polysaccharide which is then hydrolysed directly into glucose. Gilligan and Reese (1954) brought forward evidence based on chromatography to show that several cellulolytic components are present in the extracellular filtrates of micro-organisms. Narayanamurti and Verma (1953) studied the influence of poisons on the activity of cellulase from *Polystictus versicolor*.

The phenol oxidase enzymes that are known to occur in most white-rot fungi and which give characteristic reactions (e.g. Bavendamm reaction with gallic and tannic acids) have been studied by Fåhraeus *et al.* (1949), who found that oxidases of the laccase type were secreted as extracellular enzymes by a number of white-rot fungi, and by Law (1950), who confirmed that the enzyme secreted by white-rot fungi is similar to laccase and that the oxidase occurring in some brown-rot fungi resembles the tyrosinase of mushroom and potato, but this latter appears to occur only intracellularly. Later (1955) Law reported the occurrence of laccase in *Polystictus sanguineus* and of tyrosinase in *Lentinus lepideus;* and that the nature of the phenol oxidase secreted by *Phellinus cryptarum* varied according to the medium on which the fungus was grown. Zoberst (1952) found a similar tyrosinase in *Merulius lacrymans* mycelium. Lindeberg and Fåhraeus (1952) showed that *Polystictus versicolor* and *P. zonatus* secrete a phenol oxidase of the laccase type and that the formation of laccase is stimulated either by increase in pH or by the addition of traces of KI. Fåhraeus (1952) found that the amount of laccase formed depended on the nature of the medium used; the most active preparations were obtained by culturing the fungi for 21 days on a medium containing NH_4 salts with Na acetate as a buffer. Later (1954) he studied the effect on the production of laccase of adding various substituted phenols and amines, and concluded that while laccase cannot be classed as an adaptive (induced) enzyme, its formation can be greatly stimulated. Boulter and Burges (1955) concluded that the electron transfer to molecular O brought about by oxidases of *P. versicolor* is largely via a cytochrome-c-cytochrome oxidase system. Jørgensen and Vejlby (1953) described the use of an extract of red cabbage for the rapid diagnosis of white-rot fungi, the polyphenol oxidases of which turn the purple colour into yellow.

What role this laccase, so constantly secreted by white-rot fungi, plays in the breakdown of lignin, is not yet clear. Van Vliet (1954) showed that filtrates from a medium in which *P. versicolor* has been cultured can oxidize Braun's lignin and alcohol lignin, and also show activity on tyrosine. He also showed that this fungus can grow quite well on an inorganic medium having Braun's lignin as the sole source of C. Henderson (1955) found that an extract of Birch sawdust decayed by *P. versicolor* contained both vanillic and syringic acid and that Spruce sawdust decayed by *P. versicolor* or *Trametes pini* contained vanillic acid. He concluded that these compounds had been released from the lignin by the extracellular enzymes of the fungi.

(C) GROWTH-PROMOTING SUBSTANCES

Stimulation of the growth of wood-rotting fungi, when samples of wood are introduced into the culture vessels in which they are growing, has often been observed. Since this occurs even if the wood is not in contact with the mycelium of the fungus, it is evident that some kinds of wood give off volatile substances that stimulate the growth of certain fungi. Suolahti (1951), using a strain of *Stereum sanguinolentum* for most of his experiments, found that none of the woods tested in the green condition (unseasoned) had any influence at all on the fungus. If, however, the wood was dried overnight at

100° C., many species of wood gave positive results. Pine, Spruce, Aspen and Alder all gave more positive results than Oak, Ash or Elm. He found that extraction of wood with ether removed the active substance and concluded that it was a neutral, saturated, saponifiable compound, probably a lactone. Many observers have commented on the way in which the dry rot fungus, *Merulius lacrymans*, appears to grow towards pieces of wood embedded in or attached to walls, and it may well be that its growth is stimulated by some emanation from the wood which exerts a chemotactic effect on its mycelium; but it has proved difficult to demonstrate this effect in the laboratory.

Kühlwein and Zoberst (1953) studied the need of *M. lacrymans* for growth-promoting substances and noted that increased production of yellow pigment indicates a shortage of aneurin.

(D) RESPIRATION

The effect of CO_2 concentration on the rate of growth of seven fungi that cause decay in Maple was studied by Thacker and Good (1952) who found that the optimum appeared to lie between 5 and 10%, 15–20% causing some inhibition. They concluded that the concentration of CO_2 occurring naturally in Maple boles would not significantly affect the growth of these heart-rotting fungi.

(E) TEMPERATURE RELATIONS

Mizumoto (1951) studied resistance of *Lenzites* spp. to heat under wet and dry conditions and found *L. trabea* to be the most resistant. Survival of the fungi at high temperatures was longer under dry conditions, e.g. under wet conditions *L. trabea* was killed by 300 minutes at 60° C., 180–240 minutes at 70° and 120–180 minutes at 80°, whereas under dry conditions it was killed only after 96–120 hours at 70° and 72–96 hours at 80°.

(F) MOISTURE RELATIONS

Villey (1948) studied the development of *Polystictus versicolor* on Beech wood and sawdust containing various amounts of moisture. He found that a certain amount of free water is essential for rapid development of the mycelium and noted that much higher moisture contents are required for growth in sawdust than in wood.

(G) SURVIVAL OF ROT FUNGI IN DRY WOOD

Investigations by several workers have shown that wood-rotting fungi vary greatly in their resistance to prolonged desiccation. Scheffer and Chidester (1948) found that quite a number of species can survive for more than 5 years in wood conditioned to a moisture content of about 12%. Findlay (1950) found that while *Merulius lacrymans* died out after 4 months in air-dry wood, species of *Lenzites* could survive more than 64 months, and later Findlay and Badcock (1954) reported that they had survived over 9 years. In further tests with samples infected with *M. lacrymans* they found no growth after 42 weeks' exposure to dry conditions. It is evident that simple air-drying cannot be relied on to kill latent fungal infection in wood within any reasonable period. Indeed, Findlay (1950) found that the fungi survived rather longer in really dry wood, i.e. at 5 or 12·5% moisture content, than in wood at 16 or 22%.

According to Schulze and Theden (1948), the rate at which infected wood is dried affects the survival of the fungi to a considerable degree; and Scheffer and Chidester (1948) found that *Poria incrassata* survived more than 5 months in naturally infected wood that had dried out slowly, but was killed in 2 weeks in artificially infected wood by immediate exposure to dry conditions.

(H) FRUCTIFICATION OF BASIDIOMYCETES IN CULTURE

Recognition of the fungi isolated from decayed wood often depends on the ability of the unknown fungus to form recognizable fructifications in culture. Most of the earlier work merely described how by the use of empirical methods, certain species had been successfully brought to fruition. Papazian (1950) described a method for growing fruit bodies on vermiculite soaked in 5% nutrient solution. Lohwag (1952) listed the higher fungi that he and other workers had successfully brought to fructify in culture and described the methods which he had found successful. Plunkett (1954), who has studied the influence of various factors on the fructification of Hymenomycetes under controlled conditions, found that *Collybia velutipes* was unable to fructify in an atmosphere containing over 5% CO_2 and that even 1% checked pileus development. Fruiting occurred over quite a wide range of humidities when CO_2 was removed by presence of alkali or renewal of the air. He found that *Polyporus brumalis* forms fructifications only when the temperature is maintained at or below about 15° C. and that it will tolerate a fairly dry atmosphere.

(I) METABOLIC PRODUCTS

Birkinshaw and his co-workers have continued their investigations on the metabolic products formed by wood-rotting fungi. Birkinshaw *et al.* (1944) showed that the sweet odour produced in cultures of *Trametes suaveolens* is due to methyl anisate and anisaldehyde and (1952) that the latter substance is probably also responsible for the odour of *Polyporus benzoinus*. They found that a triterpenoid acid (polyporenic acid) produced by *P. benzoinus* in culture had a powerful antibiotic action against Mycobacteria. In general, wood-inhabiting Basidiomycetes have yielded few antibiotics of any importance. Oppermann (1951) examined the antagonistic action of wood-rotting fungi *inter se* and found that *Merulius lacrymans* and *Armillaria mellea* repelled the advance of nearly all the other species tested.

Whitaker (1951) studied the C balance of the metabolic products of 40 species of wood-rotting fungi grown in a glucose/urea medium and found that, under the conditions tested, CO_2 and mycelium were the only major end products of most of the species examined. Whitaker and George (1951) found that under the same conditions of culture *Polyporus abietinus* produces appreciable amounts of *d*-mannitol and that ethanol is produced by *Peniophora gigantea* and *Hydnum septentrionale*.

Narayanamurti *et al.* (1952) studied the acid production of several fungi cultivated on sawdust and detected the presence of formic and butyric acids. Owing to the better aeration in sawdust, less acid may be produced than in solid wood, so that results from experiments in sawdust do not necessarily hold good for solid wood. The production of organic acids by wood-rotting fungi has also been studied by Walter (1955); and the mechanism by which oxalic acid may be formed by such fungi, by DeBaun *et al.* (1950) and Stevens *et al.* (1951). Mangenot (1954) has related the fungal flora of felled wood to its pH. Nesemann (1953), studying the antagonism between various wood-rotting fungi, found that malt media in which certain fungi had been cultivated could inhibit the growth of others; he ascribed part of this antagonistic effect to the acids (especially the oxalic acid) formed by the fungus that was allowed to grow first.

A comprehensive review of work during the present century on the metabolic products of 170 species of Basidiomycetes has been made by Ralph (1949). Zoberst (1952) studied the conditions under which a yellow pigment of quinoid type is formed by *Merulius lacrymans*. He noted that the respiration of coloured mycelium was 100–150% greater than that of the colourless.

5. DECAY OF WOOD BY MICRO-FUNGI AND BACTERIA

Until quite recently it was assumed by most investigators that the lignified cellulose in wood could be decomposed only by the higher Basidiomycetes (Polyporaceae, Agaricaceae and Thelephoraceae) and by a few of the larger Ascomycetes such as species of *Xylaria*, *Hypoxylon*, *Daldinia* and *Ustulina*. Recent investigations, however, have shown that many micro-fungi, previously known as the cause of breakdown only in fabrics manufactured from cellulose fibres, are capable of causing decay in wood. Their method of attack, which was first described by Bailey and Vestal (1937), is highly characteristic, for their hyphae penetrate the secondary cell-walls longitudinally, eroding, in the thickness of the walls, tunnels that follow the angle of the cellulose fibrils. Bailey and Vestal did not identify the species involved but suggested that they might be Pyrenomycetes. Barghoorn and Linder (1944) found a somewhat similar type of attack in wood and cordage that had been exposed in the sea, from which they were able to isolate and identify a number of Fungi Imperfecti and Pyrenomycetes, some of which are truly marine species.

Savory (1954a) was able to show that the decomposition of the wooden slats in water cooling towers is due to the attack of cellulose-destroying 'moulds' such as *Chaetomium globosum* and other *Chaetomium* spp., *Stysanus* sp. and *Orbicula parietina*. He used the term 'soft rot' to describe the type of decomposition brought about by these fungi, in which the wood retains its shape but becomes soft, and extremely brittle when dry. He found that 'soft rot' is in fact extremely common in the surface of wood that has been in contact with soil, and suggested that it is of economic importance when conditions are not favourable for Basidiomycetes, yet do not completely inhibit fungal growth, as when wood is saturated with water. He further (1954b) showed that the rate of decomposition of Beech wood by *Chaetomium globosum* under laboratory conditions is greatly stimulated by the addition of nutrients (N and phosphates) to the wood, and that over a wide range of concentrations the amount of decay is directly proportional to the quantities of these nutrients available.

Findlay and Savory (1954) suggested that damage from soft rot might assume economic importance when hardwoods are in contact with fertile soil, particularly at high temperatures and when the growth of Basidiomycetes is inhibited by too high a moisture content or by toxic chemicals in concentrations that the soft rot organisms can still tolerate. Since the decomposition is usually confined to the surface layers of the wood, it is in thin material such as plywood, where the ratio of surface to volume

is high, that soft rot may cause damage most rapidly. Coniferous woods are generally much more resistant to soft rot than timbers from broadleaved trees, and it is only under severe conditions, such as exist in water cooling towers, that softwoods suffer serious damage from its attack. These workers also showed that the damage caused by soft-rot organisms can readily be detected microscopically if sections of the decayed wood are examined under polarized light, when the cavities formed by the hyphae in the cell walls appear dark in the bi-refringent cellulose of the wall. Meier (1955) published electron micrographs of cell walls of Spruce and Birch wood attacked by *Chaetomium globosum*, which showed clearly that the attack is limited to the secondary thickening in the fibre and tracheid walls and that the innermost 'tertiary' layer (next to the lumen) resists attack.

Savory (1955) in assessing the significance of soft rot in practice, pointed out that much of the ultimate decay of the treated zone of preserved timber is the result of attack by micro-fungi and suggested that representative species should be included among the fungi used in laboratory tests on the toxicity of wood preservatives.

It has been shown by several workers that finely ground wood can be fermented by thermophilic bacteria, but the extent to which bacteria can decompose solid wood has not yet been fully determined. Liese (1950) described and illustrated a case of active bacterial attack on Pine sapwood that had been kept under waterlogged alkaline conditions. Savory (1954b) noted and figured an example of bacterial breakdown of the surface of Californian Redwood slats from a water cooling tower: microscopic examination revealed the presence of numerous minute pittings in the walls. Clausen and Kaufert (1952) have suggested that the deterioration of the heartwood in standing Aspen and Poplar may be the result of bacterial attack.

6. INFLUENCE OF DECAY ON THE PHYSICAL AND CHEMICAL PROPERTIES OF WOOD

(A) PHYSICAL PROPERTIES

The effects of wood-destroying fungi on the cells walls in Spruce and Birch wood have been studied afresh by Meier (1955), who obtained excellent electron micrographs of the cell walls after exposure to brown and white rots. Buro (1954), studying the changes in dimensions and volume of a piece of wood undergoing decay, found that Pine wood attacked by brown rot shrinks progressively but that Beech during the early stages of a white rot (*Polystictus versicolor*) at first swells, shrinking only at a later stage. Above 40% loss in weight, considerable shrinkage in length (i.e. in the direction of the fibres) occurred in wood attacked by a brown rot. Buro compared the absorption of water by sound wood and by wood in various stages of decay, and found that at high relative humidities wood in an advanced stage of decay took up more moisture, but in an atmosphere of low relative humidity, less. He also measured changes in the swelling capacity of wood resulting from decay.

Narayanamurti and Jain (1954) recorded some changes in the rheological properties of wood as a result of fungal decay; they found that the elastic constants decrease and the damping capacity of wood increases with decay.

Richards (1952) made a study of the dielectric properties of wood in various stages of decay and concluded that the difference between the readings on a conductivity and a dielectric moisture meter seemed to be a fairly good non-destructive test for decay, the former being consistently higher than the latter for decayed pieces of wood.

The use of an ultrasonic pulse to detect internal deterioration of wooden poles has been suggested by R. Jones of the Road Research Laboratory, D.S.I.R. (unpublished communication). Preliminary studies of the possibility of using gamma radiation from a low-energy source for detection of unsoundness in logs have been undertaken in New South Wales. Truman (1952) has reported on the value of X-ray photographs for detection of rot in standing poles. The decrease in the amount of specific torque energy necessary to bore into wood affected by decay was found by Saho (1953) to be closely correlated with the loss in density, and he considers that this boring method gives a sufficiently accurate indication of the degree of decay.

Richards (1954) studied the physical effects of two brown- and two white-rot fungi on Red Gum and Pine specimens; of the four fungi used, only *Poria monticola* reduced the wet volume significantly, though both brown rots reduced dry volume considerably. He found no consistent difference between the white-rot and the brown-rot organisms in their effects on toughness at the same weight-loss levels. Pechmann and Schaile (1950), on the other hand, found that loss in impact bending strength brought about by white-rot fungi was less rapid than that caused by brown rots, some of which caused 60% loss in bending strength with a weight loss of only 5%. They ascribed the sharp drop in bending strength to disintegration of the long-chain molecules. Asano and Fujii (1953), comparing the effects

of a brown and a white rot on the strength of Japanese Beech, found little difference in loss of compressive strength but a more rapid loss in impact bending strength through the brown rot.

Traces of incipient decay are often present in Beech logs and it is important to know how seriously the strength of the wood has been affected. Mayer-Wegelin (1953) carried out a carefully controlled series of experiments to determine how far density, compressive strength and work to maximum load are reduced as a white rot progresses. He found no reduction in density until 10% of the cross-section area showed incipient white rot; toughness (impact strength), however, was affected as soon as white flecks appeared.

Mulholland (1954) followed the changes in strength of Sitka Spruce under decay by *Poria monticola* and confirmed that the wood may be seriously weakened when the fungus has caused only 2% loss in dry weight.

Wood (1954) examined the strength properties of Douglas Fir in various stages of white pocket rot caused by *Fomes* (*Trametes*) *pini* and found that in the lightly affected grades, strength properties were reduced by about $\frac{1}{3}$, stiffness by about $\frac{1}{4}$ and shock resistance $\frac{1}{2}$ to $\frac{2}{3}$, while the nail-holding capacity of the wood was reduced to about 60% of that of sound wood. Determination of loss in nail-holding capacity has been suggested by Fukuyama and Kawase (1954) as a method for measuring the degree of wood decay.

Wood (1955) found that timber decayed by white pocket rot dried faster than sound wood; and while the fungus never does any serious further damage to the wood after it is in service, the affected wood is more subject to decay since it absorbs water more readily than sound wood.

Eades and Alexander (1954) studied the streaky red heart in Douglas Fir and were able to show that it is not the result of fungal action, and further that there is no difference in strength properties between normal and red-streaked Douglas Fir.

(B) CHEMICAL PROPERTIES

A comprehensive review of the chemical aspects of the biological decomposition of wood was made by Campbell (1952), who surveyed work up to that date.

In a useful survey of the literature on decay in pulpwood, Glennie and Schwartz (1950) reviewed earlier studies of the effects of decay on the chemical composition of pulpwood. Fåhraeus *et al.* (1949) studied the breakdown of Birch sawdust by *Stereum rugosum*, *Polyporus abietinus* and *Marasmius scorodonius* and found that the two latter species increased the solubility of residual cellulose in Schweitzer's reagent. Apenitis *et al.* (1951) followed the course of decomposition of Spruce wood by four brown-rot fungi and found that, while the cellulose could be almost completely destroyed, the pentosans seemed to contain fractions that are more resistant to fungal attack. Although lignin accumulates during the breakdown of wood by these fungi, it is changed in various respects. Pechmann and Schaile (1951) found no increase in alkali solubility of Beech wood undergoing decay by *Polystictus versicolor* or *Stereum rugosum*. An important difference between white and brown rots is that the alkali solubility rises as decay of brown-rot type proceeds and the chains of cellulose molecules get broken. Enkvist *et al.* (1954), comparing the elementary composition of lignin before and after exposure to brown-rot fungi, found a reduction in the vanillin yield in lignin from the rotted wood. Lindgren (1955) suggested the use of an indicator, Alizarine Red S, to detect incipient decay caused by *Peniophora gigantea* in Southern Pines. The solution stains infected sapwood yellow, uninfected sapwood turning pink or red.

7. NATURAL DURABILITY OF WOOD

Further investigations by a number of workers have failed to reveal any general correlation between density or rate of growth and natural durability. Rennerfelt (1947) could find no relationship between density or ring width and resistance to decay in heartwood of Scots Pine. Suolahti (1948*a*) tested the decay resistance of Scots Pine timber from different site classes and concluded that density and amount of latewood have no important influence. Scheffer and Englerth (1952), studying second-growth Douglas Fir timber, concluded that the variations in decay resistance associated with the size and age of the trees have no practical significance, and that the larger differences found between individual trees are probably of genetic origin. Gäumann (1948) examined the resistance to decay of samples taken from Larch that had grown at various elevations between 460 and 2100 m. above sea level and found that the wood from trees grown between 1100 and 1700 m. was on the average more durable than wood from trees grown at higher and lower elevations. Within a single bole, wood from the central portion of its length was about 5% more resistant than wood from its upper and lower extremities. He found that the heartwood of trees 100 years old was 15–20% more durable than heartwood from trees over 200 years old. He was unable to find any general correlation between durability and specific gravity,

the proportion of latewood or the fat, resin or lignin contents. Jørgensen (1953) reported no difference in the resistance of slow-grown and fast-grown Oak to attack by *Coniophora cerebella* or *Polyporus sulphureus*. Englerth and Scheffer (1954), in discussing results of durability tests on poles of four western U.S. species, point out that while specific gravity does not in itself seem to be an important factor in decay resistance, it may in some woods be related to the presence and amount of the chemicals reponsible for such resistance.

The presence of bluestain has again been found not significantly to affect the durability of Pine sapwood (Aoshima and Kobayashi, 1952).

There seems to be a general tendency for the outer heartwood to be more resistant to decay than the inner zone. Scheffer and Duncan (1947), in laboratory tests on a number of Central American woods, found this to be the case in about half the species tested. Scheffer and Hopp (1949) reported a similar tendency in Black Locust (*Robinia pseudoacacia*), decay resistance increasing radially from the pith to the outer heartwood; there were also significant variations between varieties of the species which they attributed to genetic differences.

This durability trend was corroborated by Scheffer, Englerth and Duncan (1949) for 3 species of the White Oak group; they asserted that "the differences were large enough to account for very considerable differences in the service life of wood from different parts of large logs". They, too, concluded that variability in decay resistance was to be attributed more to genetic differences than to differences in the trees' environment. Zabel (1948), finding similarly for White Oak (*Quercus alba*), suggested that Oak timber containing boxed-in heartwood should not be used under conditions favourable for decay. European Oak was found by Jørgensen (1953) to show the same trend; in all the trees examined, the inner heartwood proved to be more severely decayed than the outer. In Western Red Cedar, Englerth and Scheffer (1954) found important differences to exist vertically as well as radially, the upper third of the bole being less durable than the lower two-thirds. In comparative tests of Japanese and European Larch, Pechmann and Schaile (1955) reported that the outer heartwood tended to be more durable than the innermost zone, with little difference between the species.

Van Ree (1954) has suggested that samples for durability tests should be taken from three places in the radial direction of the log. Bavendamm (1944), who grouped the timbers that he tested into six durability classes, pointed out the tendency for woods of trees belonging to the Leguminosae to be naturally durable and later (1948) published a comprehensive survey of previous work on natural durability. Wigg (1946) gave a list of 282 East African timber species with information on their reputed or tested durability; his observations on the behaviour of field test pieces relate mainly to attack by termites. Da Costa (1949) listed the principal Australian timbers in four durability classes and discussed methods of testing natural durability, commenting that the results of laboratory tests can be closely correlated with the results of field tests.

The effect of soil type on the rate of decay of various Austrian woods was studied by Herzner (1949) who found that conifers lost most weight in acid soils and hardwoods most in basic. Smith (1949) described the results of field service (graveyard) tests at 3 sites in England differing widely in rainfall and soil, on samples of a wide range of timbers from the British Commonwealth.

The durability of Congo timbers has been investigated by Eeckhout (1952*b*), who carried out laboratory tests on 23 species which he classified on the basis of their durability relative to that of Oak, and by Roosen (1954) who did standard tests on 43 species, basing their durability rating on the loss in weight brought about by four species of fungi. Akai and Hibino (1950) used nine species of fungi in their tests on Japanese coniferous woods. They found *Chamaecyparis obtusa* to be the most resistant of the 5 species tried. Mizumoto (1954), in laboratory tests of 13 species of Japanese hardwoods, reported that *Castanea crenata* and *Zelkova serrata* were the most durable. Moses (1955) found the decay resistance of true Mahogany (*Swietenia* spp.) to be higher than that of other so-called Mahoganies from Africa and the Philippines. In *Swietenia* and *Khaya* a positive correlation existed between rate of absorption of water and susceptibility to decay, the more permeable samples showing the most decay.

Zubieta and Gomez (1955) compared the results of laboratory tests on two durable timbers, using malt agar and soil, or sawdust plus nutrients, as the medium for the test fungi. They found that the highest losses of weight generally occurred with malt agar as the medium.

(A) DURABILITY AND EXTRACTIVES

There have been important advances in the study of the extractives of wood and their effect on its decay resistance. Rennerfelt (1943) showed that the phenolic compounds which Erdtman had isolated from the heartwood of Scots Pine and named pinosylvin and pinosylvin monomethylether are highly toxic to wood-rotting fungi, and that impregnation of samples of sapwood with solutions of these

compounds renders them less liable to attack. In a later paper (1947) he was able to show that the greater resistance to decay of the outer heartwood of Pine can be related to its higher content of pinosylvin compounds. Erdtman and Rennerfelt (1949) also measured the toxicity to fungi of thymoquinone and similar related compounds isolated from the wood of *Tetraclinis* (*Callitris*) *articulata*.

Southam and Ehrlich (1943), who examined the toxicity of extracts from *Thuja plicata*, found considerable variation in resistance between different fungi and obtained some evidence that the fungi tested could, by progressive culturing on higher concentrations, become adapted to growing on much higher concentrations than initially found tolerable.

Rennerfelt (1948) tested the toxicity of pure preparations of the three isomers of thujaplicin isolated from heartwood of *T. plicata* and found them highly toxic both to wood-rotting and to bluestain fungi, their toxicity being comparable with that of Na pentachlorophenate.

Roff and Atkinson (1954), finding that *T. plicata* extractives from which the thujaplicins had been completely removed still retained considerable toxicity towards *Poria monticola*, concluded that these compounds are not solely responsible for the durable character of Western Red Cedar.

A survey of the various substances found in the heartwood of conifers has been made by Rennerfelt and Nacht (1955), who tested their toxicity to fungi and found that the resistant species contained fungicidal substances.

Waterman (1946) examined the toxicity to *Lenzites trabea* and *Poria microspora* of aqueous extracts from the outer heartwood of 35 tropical American timbers and concluded that only very general indications of relative decay resistance could be obtained from such tests.

Zabel (1948) found aqueous extracts from the heartwood of White Oak to be highly toxic to wood-rotting fungi and concluded that the durability of this species is probably associated with its high tannin content. There were considerable differences in durability between individual trees as well as differences within the heartwood of a single tree. He suggested that a good indication of the probable durability of Oak timber can be gained by estimating the amounts and toxicity of the hot-water extractives. Scheffer, Lachmund and Hopp (1944) concluded that the durability of Black Locust is largely due to its content of toxic extractives. They found that the total content of extractives was a better index of the decay resistance of the wood than the toxicity of the extract, as measured by inhibition of fungi on agar, and that the intensity of the yellow colour of the sawdust was related to the amount of extractive present and was therefore a rough indication of the durability of the wood. The antifungal agent presumed to be responsible for the durability of Osage-orange (*Maclura pomifera*) has been identified by Barnes and Gerber (1955) as tetrahydroxystilbene.

The whole subject of the extractives of wood has been under extensive investigation at the University of Nottingham by Professor F. E. King, who surveyed some of his work in 1953. Simonsen (1954) has also discussed the importance of extractives in relation to the durability of wood.

The decay resistance of wood is not generally adversely affected by any of the chemicals with which it normally comes into contact, but some tests made by Krause (1954) suggest that reaction with iron of the tannates in woods, such as Oak and Mahogany, may reduce their fungal resistance.

(B) EFFECT OF VARIOUS TREATMENTS ON DURABILITY

Nagai *et al.* (1955), comparing the decay resistance of Beech (*Fagus crenata*) felled at different times of the year, concluded that the time of felling exerts no influence upon the resistance of this timber to decay.

Suolahti (1948*b*) examined the effect of prolonged soaking in water on the decay resistance of Pine and found that specimens soaked for six months were less vigorously attacked than the unsoaked controls, the effect being most pronounced with specimens left in unchanged water and more apparent with *Lentinus lepideus* than with *Coniophora cerebella*. He suggested that the wood might have absorbed some antibiotic substance produced by micro-organisms growing in the stagnant water. Moses (1955) found that weathering tended to increase the susceptibility to decay of various species of Mahogany.

The effect of steaming on Beech and Pine was studied by Eeckhout (1952*a*) who found that it appreciably reduced the resistance to decay of air-dry Beech but had no such effect on green Beech. The durability of both species was found by Buro (1954*c*) to be appreciably increased by heating in air (4 hours at 200° C.) or in N (1 hour at 250°). Complete resistance to decay was achieved only when the wood had lost 8–10% of its dry weight, and at the cost of other desirable properties of the wood. In a later paper (1955) Buro reported that heating wood in a molten mixture of Zn, Pb and Cd metals increased its durability more than heating in air or N.

To be concluded.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 2864, 3094, 3256, 3301, 3351, 3396.

0 (02). Handbooks. Manuals. Textbooks

2364. BOLTON, LORD. **Profitable forestry.** Faber and Faber Ltd., London. 1956. pp. 126 + 9 photos. Price 15*s.*

Designed for the private owner who is intending to manage his woodlands for profit. The following are the chapter heads: How to secure an annual income; Tree identification; Principal timber-producing trees; Choice of species; The importance of strain; The care of plantations during the early years; Thinning and pruning; Marketing; Natural regeneration; Commercial forestry and sporting interests; The dedication scheme, controls, grants, and taxation; Commercial forestry and amenity.

2365. EDLIN, H. L. **Trees, woods and man.** *New Naturalist*, Collins, London. 1956. pp. xv + 272 + 48 plates. 6 pp. of refs. Price £1. 10*s.*

Contains the following sections: (1) The natural setting (growth, structure and function of the tree; the tree in the forest community; physical environment; biological environment; natural forests in Britain); (2) Man's influence on the forest (clearance and settlement; mediaeval forests; the age of enclosures; parks and plantations; new forests of the twentieth century; which way to the woods?). (3) Studies of particular trees (the Oaks, Beech and Ash, Birch and Alder, Sycamore and other Maples, Hornbeam and Lime, Sweet Chestnut and Hazel, Willows and Poplars, Elm, thorns and other trees of the Rose family, small native broadleaved trees, alien ornamental broadleaved trees and woodland shrubs; the Pines, Larches, Spruces and Silver Firs, other forest conifers, parkland and garden conifers).

0 (038). Dictionaries

See No. 2373.

0 (048.1). Bibliographical Lists

See also Nos. 2424, 2464, 2591, 2606–7, 2927, 2945, 3288, 3403, 3528.

2366. AVERELL, J. L., CROWELL, J. C., QUICK, C. R., and SCHUBERT, G. H. **Sugar Pine management—an annotated bibliography.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 12, 1955. pp. 56.

Contains 174 short abstracts, mainly from American literature since about 1900. There is a brief subject index. Subjects covered include breeding, injuries, logging, management, regeneration, seed supply, stand improvement and wood properties.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

See also Nos. 3544–5.

2367. **Co-operative Woodland Societies for Private Woodland Owners: Woodland Bulletin.** Welsh Agricultural Organisation Society Ltd., Aberystwyth. No. 1, 1955. pp. 10.

A mimeographed bulletin (periodicity not stated). No. 1 [? Dec. 1955] consists of 10 pages of notes on the activities of Welsh forestry co-operatives. Citation in *For. Abstr.*: *Woodl. Bull. Welsh agric. Organ. Soc.*

2368. ***Bulletin of the Indian Council of Ecological Research.*** Indian Council of Ecological Research, New Forest, Dehra Dun, India.

Periodicity not stated. Vol. 1, No. 1, Oct. 1955, consists of 22 pages. Citation in *For. Abstr.*: *Bull. Indian Coun. ecol. Res.*

2369. ***Journal of the Japan Wood Research Society.*** Japan Wood Research Society, c/o Government Forest Experiment Station, Meguro, Tokyo. Quarterly. P.R.

Started in July, 1955. Citation in *For. Abstr.*: *J. Jap. Wood Res. Soc.*

2370. ***Referativnyĭ Žurnal. Himija.*** Izdateljstvo Akademii Nauk SSSR, Moskva. Semi-monthly. Price *Roubles* 18 per issue (*Roubles* 432 p.a.) P.O.

Started publication Jan. 1954. To contain ca. 2500 classified abstracts per issue. Each issue includes an author index. Citation in *For. Abstr.*: *Referat. Ž.* (*Him.*).

0 (084.3/.4). Maps. Atlases

See also No. 2606.

2371. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. [**Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi.**] I.N.É.A.C., Bruxelles, 1955. [F.]

[Cf. *For. Abstr.* 16 (No. 2587); 17 (No. 3140).] The parts here noticed are: (3) *Ruzizi valley, Kivu*—(*A*) Soils (1:100,000); (*B*) Soils (1 : 50,000 detailed map of the region between Sange and the Kiliba); Explanatory note (pp. 48; 12 refs.).

(5) *Mosso, Urundi*—(*A*) Soils (1 : 200,000 reconnaissance map; 1 : 50,000 detailed map of the Kininya region; 1 : 50,000 ditto of the Kiofi region); (*B*) Vegetation (1 : 200,000); (*C*) Soil utilization (1 : 200,000); Explanatory note (pp. 40 + 6 photos; 10 refs.).

0 - - 011. Terminology. Nomenclature

See also No. 2492.

2372. **Multilingual forest terminology.** *Unasylva* 9 (4), 1955 (165–8).

Describes the design and proposed mechanics of construction of a series of forest terminologies in different languages, keyed to a basic terminology in English, which are to be prepared under the auspices of the Joint FAO/IUFRO Committee on Bibliography.

2373. García-Piquera, C. Glosario de terminología forestal. **[Glossary of forest terminology.]** *Monogr. Dep. Agric. Com. Puerto Rico* No. 5, 1955. pp. vi + 72. 204 refs. [Span.E.]

A compilation of the glossaries that have already appeared in the *Caribbean Forester*. [Cf. *For. Abstr.* 12 (No. 896).]

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

See also Nos. 3126–9.

111.5. Wind

See also Nos. 2807–10.

2374. Troll, C. Die Lokalwinde der Tropengebirge und ihr Einfluss auf Niederschlag und Vegetation. **[The local winds of mountains in the tropics and their influence on precipitation and vegetation.]** *Bonner Geographische Abhandlungen, Bonn* No. 9, 1952 (124–82 + 1 map). 69 refs. [G.]

With examples from S. America and Africa.

111.8. Climatology. Climate and Microclimate

See also Nos. 2374, 2378, 2535, 2613, 2810.

2375. Tomanek, J. Mikroklimatyczne różnice rozkładu temperatur powietrza w koronie drzewa. **[Microclimatic differences in temperature distribution in the tree crown.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (261–74 + 1 tbl.). 9 refs. [Pol.pol. russ.e.]

Presents results of measurements made during 130 days in the crown of a tall Apple tree by means of 5 recording thermometers arranged in the form of a vertical cross.

2376. Anderson, M. L., and Fairbairn, W. A. **Division of Scotland into climatic sub-regions as an aid to silviculture.** *Bull. For. Dep. Univ. Edinb.* No. 1, 1955. pp. 31. Price 10*s*.

Climatic sub-regions were determined by combining data on temperature and precipitation in the form of length of growing season and growing-season rainfall, and then fixing their boundaries on the map, smoothing the lines to agree with recognizable topographical features.

2377. Lauer, W. Humide und aride Jahreszeiten in Afrika und Südamerika und ihre Beziehung zu den Vegetationsgürteln. **[Moist and dry seasons in Africa and S. America, and their relation to the vegetation zones.]** *Bonner Geographische Abhandlungen, Bonn* No. 9, 1952 (15–98 + 1 map + 4 tbls.). 354 refs. [G.]

The first part analyses types of moisture climate in the two continents on the basis of a classification of each month by de Martonne's 'index of aridity', using the value 20 as the division between moist and dry months. A map shows the 'isohygromens' (lines joining places with equal numbers of dry or moist months) for both continents. The second, briefer, part compares the distribution of the vegetation zones with the 'isohygromens'. Supporting data are given in tables and graphs.

114. Soil. Soil Science

See also No. 2607.

114.1. Soil Physics

See also Nos. 2390, 2393–4, 2398, 2407, 2409, 2779, 3119.

2378. Shanks, R. E. **Altitudinal and microclimatic relationships of soil temperature under natural vegetation.** *Ecology* 37 (1), 1956 (1–7). 17 refs. [University of Tennessee.]

Soil temperature data from 6-inch depth at weekly intervals provide a useful index to altitudinal and microclimatic temperature differences in the closed forest vegetation of the Great Smoky Mountains, correlating more closely than the means of weekly maximum and minimum air temperatures with standard weather record means. The lag in heat transfer is such that the soil temperatures constitute a useful integration of radiation and air temperature conditions during the preceding week. Instruments and measurement procedures were evaluated. Thermocouple calibration gave no evidence that the metallic thermometer was less reliable than standard mercury-in-glass thermometers. Variation from the median within sets of three readings exceeded 1° F. in only 5·9% of the cases. Time of day appeared to introduce less than 1° error into the series of readings. This degree of precision was adequate to reveal microclimatic differences between adjacent habitats which differed in vegetation, such as the Beech gaps and adjacent Spruce forests, or deciduous coves and adjacent Hemlock forests. Microclimatic temperature differences were recorded which on occasion were the equivalent of

as much as 2000 feet of altitudinal temperature difference. *Author's summary.*

114.2. Soil Chemistry

See also Nos. 2387–90, 2393–6, 2399–400, 2402–3 2409, 2562, 2785.

2379. LIVENS, P. J. Degré de saturation d'une séquence de sols forestiers sur limon loessique. **[Degree of [base] saturation of a sequence of loess soils under forest cover.]** *Trans. 5th int. Congr. Soil Sci., Léopoldville 1954* Vol. 2, 1955 (376–83). [F.f.e.] [Institut Pédologique de l'Université de Louvain, Belgium.] H.S.B.

The degree varies highly with the degree of evolution of the soil, and each member of the sequence is characterized by a typical saturation curve. Transitional soils, such as occur in a group of leached soils, are easily recognized by the degree of saturation of some genetic horizons. A good correlation is shown to exist between degree of saturation and pH. *From author's summary.*

2380. BOGGESS, W. R. **Soil reaction as related to vegetative cover and land use for some important soil types in Southern Illinois.** *For. Note Ill. agric. Exp. Sta.* No. 67, 1956. pp. 4.

A large number of measurements were made on (*a*) native hardwood stands, (*b*) Pine plantations, (*c*) abandoned farm land. Except for the A_1 horizon, profiles under (*a*) were more acid than either (*b*) or (*c*), which were about the same. Decomposition of litter was rapid on (*b*), and there was little accumulation of raw humus such as occurs under conifers in cool humid regions to the north.

2381. ENDREDY, A. S. DE, and MONTGOMERY, C. W. **Some nutrient aspects of the Gold Coast forest soils.** *Trans. 5th int. Congr. Soil Sci., Léopoldville 1954* Vol. 3, 1955 (268–73). 6 refs. [E.e.f.] [Department of Soil and Land-Use Survey, Gold Coast.] H.S.B.

A statistical examination of the data of 51 profiles from the central forest zone of the Gold Coast emphasized the accumulation of plant nutrients in the 2- to 3-in. surface horizon. The concentration of bivalent bases, Ca, Mg and Mn, was particularly conspicuous. K was less concentrated. Acid-soluble P also occurred predominantly in the surface horizon, and there appeared to be a definite regression between this category of P and the total N content. *From authors' summary.*

2382. THEMLITZ, R. Beitrag zur Phosphorsäurefestlegung durch verschieden gealterte Eisenoxyhydrate und Phosphorsäureaufnahme durch Kiefern in Gegenwart solcher Hydrate bei verschiedener Reaktion. **[The fixation of P_2O_5 by iron hydroxides of varying age, and uptake of P_2O_5 by Pines in the presence of such hydroxides at different pH levels.]** *Phosphorsäure, Essen* 13 (4), 1953 (220–31). 17 refs. [G.g.] H.S.B.

Fresh Fe hydroxides kept continually moist have a higher buffer capacity than similar hydroxides dried in the air or at temperatures of 100° C. With aging of Fe hydroxides, fixation of P_2O_5 decreases. Fixation of P_2O_5 also depends on and increases with decreasing pH. P_2O_5 fixation was very high when pH of the associated solutions sank below ca. 3·0. These experiments were amplified by trials with *Pinus sylvestris* seedlings. A soil of quartz sand was used with 2% nontronite from which bases had been substantially removed, and was brought to 2 different pH levels by addition of Ca. Fresh Fe hydroxides had a more adverse effect on growth and on P_2O_5 uptake than those dried at room temperature; Fe hydroxide dried at 100° C. had the least adverse effect of all. Yield and P_2O_5 uptake were, within narrow limits, dependent upon pH. *From author's summary.*

2383. MADANOV, P. V., and IVANOVA, E. I. Soderžanie molibdena v nekotoryh počvah i rastenijah Volžsko-Kamskoĭ lesostepi. **[Molybdenum content of some soils and plants of the Volga-Kama forest-steppe.]** *Učenye Zapiski Kazanskogo Universiteta* 114 (1), 1954 (177–81). [Russ.] Title in *Referat. Ž.* (*Him.*) 1954 (19), (No. 43182). [Russ.] P.O.

2384. FLAIG, W. Zur Bildungsmöglichkeit von Huminsäuren aus Lignin. **[Possibility of formation of humic acids from lignin.]** *Holzforschung, Berlin* 9 (1), 1955 (1–4). 18 refs. [G.g.e.] P.R.

Lignin might be one of the products from which humic acids are formed. The loss of OCH_3 groups would result in the formation of phenols, and polyphenols can be used for making model substances of humic acids. Other mechanisms are discussed.

2385. AMBROŽ, Z. Sostav i izmenenija peregnoja v nekotoryh lesnyh počvah. **[The composition and changes of humus in some forest soils.]** *Folia Biologica, Praha* 1 (1), 1955 (48–53). 9 refs. [Russ.g.] H.S.B.

Samples of rendzina and podzolic soils, from [pure?] stands of Spruce and of Oak in Czechoslovakia, were analysed by Tjurin's method for their content of humic (*a*) and fulvic (*b*) acids (expressed in % of total C) in both the mobile (i) and the bound (ii) humus fractions. Results (tabulated) showed that in the rendzina (*a*) $\simeq$ (*b*), and (i) $\simeq$ (ii), whereas in the podzolic soil (*b*) > (*a*) and (i) > (ii). The preponderance of (*b*) and (i) was especially marked under Spruce and was apparent, though slight, even for the rendzina. Seasonal variations were also found to occur, especially in the rendzina, for which some figures are given to illustrate the marked increase of (*a*) and decrease of (*b*) in summer as compared with spring and autumn, when (*a*) decreased and (*b*) increased. These variations are attributed to variation in biological activity, since the peak populations of micro-organisms capable of decomposing humic acids were found in spring and autumn. In laboratory tests the bacterial population was found to be both higher and more active in the rendzina than in the podzolic soil. Special tests were also made in which soil suspensions were used to inoculate liquid mineral-nutrient media with added humic acids (80 mg. C/litre) either as the source of C or as the sole source of N. In these tests humic acids from the rendzina were decomposed faster than those from the podzolic soil, and

those of (i) faster than those of (ii). The bacteria [unspecified] of the suspensions used the humic acids chiefly as a source of N rather than C.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 2380, 2384–5, 2392–5, 2409, 2562, 2766, 3117–9.

2386. KOVDA, V. A. Mineraljnyĭ sostav rasteniĭ i počvoobrazovanie. **[The mineral composition of plants in relation to soil formation.]** *Počvoved.* 1956 (1), (6–38). 75 refs. [Russ.] [Počvennyĭ Institut im. V. V. Dokučaeva Akademii Nauk SSSR.] A.P.B.

A review of Russian literature on the subject.

2387. LAUDELOUT, H., and MEYER, J. Les cycles d'éléments minéraux et de matière organique en forêt équatoriale congolaise. **[Mineral and organic-matter cycles in the equatorial forest of the Congo.]** *Trans. 5th int. Congr. Soil Sci., Léopoldville 1954* Vol. 2, 1955 (267–72). 5 refs. [F.f.e.] H.S.B.

The dry weight of plant material returned annually to the forest floor in Yangambi is 12·3 metric tons/ha. in (*a*) *Brachystegia* forest, 12·4 in (*b*) mixed forest, 15·3 in (*c*) *Macrolobium* forest, and 14·9 under (*d*) *Musanga cecropioides*. The coefficients of decomposition of organic matter [cf. *For. Abstr* 11 (No. 2485)] are respectively [no figures for (*a*)]: (*b*) 76, (*c*) 63, and (*d*) 68%. The necessary time to reach 95% of the equilibrium value between the supply and the decomposition of plant material appears to be 2 years for (*b*) and 3 years for (*c*) and (*d*). The amount of mineral nutrients involved in the annual cycle corresponds to that in temperate conditions, except for N, which is 6–10 times as much. There is a correlation between the cationic composition of the plant material returned to the soil and the degree of cation saturation of the absorbing complex of the soil.

2388. Strooiselonderzoek. **[Research on litter.]** *Versl. Inst. toegep. biol. Onderz. Nat. 1954*, 1955 (9–12). [Du.] (*Meded. Inst. toegep. biol. Onderz. Nat.* No. 21.)

Measurements of litter in a 60-year Oak forest on alluvial clay showed that amounts remained constant at about 500 g./sq. m. from the end of leaf-fall in December until March, and fell to 300 g. by June, to 240 g. by July and to about 80 g. by November. The content of ether extractives fell from 6·7 to 2·4% and that of lignin rose from 29·9 to 39·6%. The comparatively small change in chemical composition suggests that the litter-eating fauna rather than fungi and bacteria are responsible for the early disappearance of litter. Litter artificially dried and replaced on the site in normal quantities was reduced in a year by only 1·3% compared with the normal 84%. In forests with a mor profile, where there is always litter remaining from the previous leaf-fall, freshly fallen leaves dry out more often and more severely than in those with a mull profile where the under-layers of freshly fallen leaves are in direct contact with the mineral soil. A study of populations in the new litter showed that all groups of litter fauna were represented within the first month and that numbers reached a maximum in July–Sept. after fluctuations caused by frost in January–February and drought in April–May.

2389. ROMELL, L. G. **[Mull and mor humus.]** *Forestry* 29 (1), 1956 (69–70).

A review of *W. Wittich* 'Der heutige Stand unseres Wissens vom Humus etc.' [cf. *For. Abstr.* 14 (No. 1882)], and *W. R. C. Handley* 'Mull and mor in relation to forest soils' [cf. *For. Abstr.* 16 (No. 1352)].

2390. BLOOMFIELD, C. **The deflocculation of kaolin by tree leaf leachates.** *Trans. 5th int. Congr. Soil Sci., Léopoldville 1954* Vol. 2, 1955 (280–3). 2 refs. [E.e.f.] [Rothamsted Experimental Station, Harpenden.] H.S.B.

[Cf. *For. Abstr.* 15 (No. 2215).] Texture differentiation, which is a frequent feature in podzolic soils, may result from the accumulation of clay in the B horizon. Experiments, reported in this paper, indicate that physical transport of clay may result from the action of rainwater charged with organic compounds leached from the A_0 horizon. It has been found that aqueous leachates of the leaves of some 15 species of broadleaved and coniferous trees, at low concentrations, have a markedly deflocculating effect on kaolin suspensions. In most cases, as the concentration of plant extract is increased, the extent of deflocculation reaches a maximum and then decreases, more or less abruptly, depending on the species. It is pointed out that Kauri (*Agathis australis*) leaves are more effective than Rimu (*Dacrydium cupressinum*) leaves in causing the deflocculation, so that this property of Kauri could be a factor contributing to its greater general effectiveness as a podzolizing agent. *From author's summary.*

114.4. Soil Classification. Soil Types

See also Nos. 2371, 2385, 2390, 3117–9.

2391. MANCINI, F. Delle terre brune d'Italia. **[The brown earths of Italy.]** *Ann. Accad. ital. Sci. for.* 3, 1955 (253–326). 101 refs. [It.f.]

2392. MANIL, G., and PECROT, A. Les sols forestiers oligotrophes du climax des Ardennes belges. **['Climax' oligotrophic forest soils of the Belgian Ardennes.]** *Trans. 5th int. Congr. Soil Sci., Leopoldville 1954* Vol. 4, 1955 (441–6). 4 refs. [F.f.e.] [Institut Agronomique de Gembloux, Belgium.] H.S.B.

The authors define their concepts of 'pedo-climax' and 'bio-dynamic solum', and apply these concepts to three soil types: (1) brown oligotrophic forest soils of moist slopes; (2) brown oligotrophic forest soils of plateaux and gentle slopes; and (3) brown-ochreous forest soils of dry slopes. These bear respectively *Fagetum-festucetum*, *Fagetum-festucetum* and *Fagetum-luzuletum*, and *Querceto-Betuletum*.

2393. MATTHEWS, B. C., HOFFMAN, D. W., and EAGLE, D. J. **Brown forest—grey wooded soil sequence in the Temiskaming district of Ontario.** *Canad. J. agric. Sci.* 35 (6), 1955 (538–51). 13 refs. O.R.E.

The genetic horizons of one brown forest soil, two grey wooded soils and one podzolized grey wooded soil from the Little Clay Belt, originally covered mainly with Balsam Fir, but now, as a result of fires, chiefly with Poplar and Birch, were analysed physically and chemically. It is suggested that the profiles studied, which all developed from deposits, containing ca. 15% carbonates, of a glacial lake that receded from the whole area at about the same time, form segments of a hypothetical soil-development sequence, and that the differences in the profiles were related to differences in the texture of the parent material. Where its clay content was less, the thickness of the horizons and the depth at which free carbonates occurred both increased, base saturation decreased and the extent of accumulation of Fe in the B_2 horizon increased.

2394. CRAENE, A. DE, and LARUELLE, J. Genèse et altération des latosols équatoriaux et tropicaux humides. **[Genesis and alteration of equatorial and tropical moist latosols.]** *Bull. agric. Congo belge* 46 (5), 1955 (1113–243). 7 refs. [F.du.e.]

The aim of these studies is to correlate genetical concepts evolved in the field with the micropedology of Kubiëna [cf. *For. Abstr.* 15 (No. 1044)]. Field characters of about 20 profiles taken across northern Belgian Congo are compared in detail with those revealed under reflected light and a magnification of 32, by a stereoscopic microscope, the horizons influenced by the fluctuating levels of the water-table receiving particular attention. The first study deals with the development of these soils on acid (basement complex granite) and on basic (amphibolite) rocks. On the former the successional stages recognized in the field (slaggy, bedded, structureless) were correlated microscopically with the evolution of the soil 'plasma' from a highly peptized, high colloid content to an overwhelming preponderance of flocculated material (the progress of '*Lehm*' to '*Erde*'). This evolution fails in the slower development from basic rocks, in the soils of which the slaggy stage occurs throughout the profile. The particles and aggregates of the soil plasma and skeleton contributing to these conditions are illustrated diagrammatically. On the Karoo sandstone soils of Ubangi, the jigsaw-puzzle distribution of forest and savanna is closely connected with the degree of alteration in the profiles, the savanna occurring generally on the most altered soils of the flatter land, and forest on the less altered soils of the undulations and slopes. As the soils characteristic of the savanna are altered through a profile 4 m. deep, the authors discount human activities as an explanation of the origin of this savanna. These soils are considered unprofitable for important plantation crops. Other studies cover basic soils carrying *Acacia seyal*/*Pennisetum purpureum* savanna of very high fertility, groundwater laterites on basement complex granite and gneisses, carrying combretaceous savanna, and pediment soils with dark horizons, carrying *Erythrina*/*Albizzia gummifera*/*Hyparrhenia* savanna in the High Ituri. A final section synthesizes the essential phenomena in the development of soils under equatorial and wet tropical conditions—the bedrock, the genesis of the parent material, factors influencing soil formation, and soil differentiation.

2395. TAMURA, T., JACKSON, M. L., and SHERMAN, G. D. **Mineral content of a latosolic brown forest soil and a humic ferruginous latosol of Hawaii.** *Proc. Soil Sci. Soc. Amer.* 19 (4), 1955 (435–9). 14 refs. O.R.E.

In the brown forest soil, an intrazonal type formed from volcanic ash, goethite predominated in the A horizon (28%) and gibbsite in the B horizon (42%). Of the two latosols examined, one, from Maui, may have derived from similar materials. Weathering *in situ* may be responsible for the profile characteristics observed.

2396. GROSSKOPF, W., and BUCH, M. VON. Zur Kenntnis der Morphologie und Durchwurzelung von Wald und Kaffeeböden in El Salvador. **[On the morphology of, and root penetration in, forest and coffee plantation soils in El Salvador.]** *Z. Weltforstwirt.* 18 (3), 1955 (81–91). 14 refs. [G.g.e.f.]

The following soils, considered typical of the comparatively young soils of volcanic origin that cover the country, are described, together with their vegetation, water regime, humus formation, topography etc. (1) *Tierra blanca*, fairly dry savanna forest soils; (2) brown, dry forest soils under coffee plantations; (3) dry gley-type soils under Morro (*Crescentia alata*) savanna, waterlogged in the rainy season; (4) red loam under dry Pine/Oak forest (chiefly *Pinus oocarpa*, *Quercus grandis* and *Q. comasaguana*); (5) tropical brown forest soils, rich in humus, under evergreen Oak cloud forest at higher altitudes (e.g. *Q. eugeniaefolia*); and (6) a stratified alluvial soil, alternately dry and wet, with a riverain or coastal evergreen forest rich in valuable species (*Brosimum terrabanum* and *Bactris subglobosa* being among the chief species). Certain properties e.g. humus and Fe_2O_3 content are tabulated.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 2540–1, 2600, 2621, 2654, 2930, 3083, 3117–9.

2397. WILLCOX, O. W. **Agrobiologic percentage method of evaluating fertilizer tests: III. Quantitative agrobiologic analysis of a factorial experiment.** *Soil Sci.* 81 (1), 1956 (57–69). 7 refs.

Demonstrates the method graphically, using data involving 4 varieties of beet, 4 levels of N and 3 harvesting dates, with particular reference to end depression curves in continuation of the author's argument [see *For. Abstr.* 17 (No. 45)] on the deficiencies in real information of variance analysis, which, he states, is sometimes grossly misleading. This defect arises from ignoring the law of diminishing returns known to apply to all green and rooted plants yet studied. An agrobiologic design for the field testing of growth factors—a long narrow block divided longitudinally into 3 equal strips, the outer ones being assigned to controls, is described.

2398. SMITTER, Y. H. **Plants as indicators of ground water in Southern Africa.** *Trees S. Afr.* 7 (3), 1955 (6–10).

Includes aerial photographs showing xerophytic vegetation with fracture lines over groundwater at 21 and 32 ft., conspicuous on which are the phreatophytes *Acacia karroo, Rhus pyroides, R. lancea, Zizyphus mucronata, Buddleia salvifolia,* and *Lonchocarpus capassa.* Others tentatively suggested [of general African interest] are *Ficus capensis, Flueggea virosa, Celtis africana, Rhamnus prinoides, Kiggelaria africana, Gymnosporia senegalensis, Euclea undulata* and *Carissa bispinosa.*

114.6. Soil Biology

See also Nos. 2385, 2388, 2544–53, 2559, 2717.

2399. DOMMERGUES, Y. Biologie des sols forestiers du centre et de l'est de Madagascar. [**Biology of forest soils of central and eastern Madagascar.**] *Trans. 5th int. Congr. Soil Sci., Léopoldville 1954* Vol. 3, 1955 (24–8). 9 refs. [F.f.e.] [Tananarive, Madagascar.] H.S.B.

Study of 5 forest soil types showed in the surface horizon (0·5 cm.) an intense bacterial activity which decreased rapidly with increasing depth. Forest soils contained a much denser population of *Clostridium* but fewer aerobic N-fixing bacteria than cultivated soils; ammonification was consequently higher and nitrification lower in the forest soils. The influence of the botanical composition of the forest stand on the biological activity of the soil was found to vary with soil type, being negligible in recently formed colluvial or alluvial soils with high mineral reserves (soils having a stable biological equilibrium), but important in old evolved alluvial soils or podzols ('fragile' soils with an unstable biological equilibrium). *From author's summary.*

2400. GYLLENBERG, H., HANIOJA, P., and VARTIOVAARA, U. Havaintoja eräiden viljelemättömien maatyyppien mikrobiston koostumuksesta. [**Observations on the composition of the microflora in some virgin soils.**] *Acta for. fenn.* 62 (2), 1955. pp. 31. 33 refs. [Fi.e.]

The investigation was carried out on samples, mostly taken from June to November, from 4 forest soils: (1) *Oxalis/Myrtillus*-type, Birch; (2) ditto, Spruce; (3) *Vaccinium*-type Pine; (4) drained Pine bog; and (5) a periodically flooded meadow. Vegetation and pH values are tabulated and the methods of the investigation described. The latter were not very suitable for the study of fungi: they revealed rapid-growing types such as *Mucor* and *Penicillium,* but only a few slow-growing moulds. The number of autochthonous [autotrophic?] bacteria, which was highest in (1), (2) and (5), varied between 270,000 and 10,000,000/g. air-dry soil. In (1), ca. 90% were Gram-negative, in (4) only 25%. N-fixing bacteria (*Clostridium pasteurianum* type) were found in all soils, but no *Azotobacter.* Nitrification, and oxidation of S, was found to proceed in (5) only. Myxobacteriales, isolated for the first time in Finland, were the only aerobic cellulose-decomposing bacteria found. A very slow anaerobic decomposition of cellulose could be observed in all samples. Actinomycetes were found in all soils. Protozoa were most numerous in (1), (2) and (3), and most varied in (1) and (3). Their numbers tended to increase during summer and to decline rapidly later in the year. It is suggested that the differences found between these soils, and particularly the number and relative frequency of Gram-negative bacteria, depend largely on the kind and abundance of their vegetation in so far as this affects the availability of certain nutrients (vitamins, amino-acids) which may be secreted by the plant roots. *From authors' summary.*

2401. LUPRET, M. Prilog izučavanju aerobnih bakterija u biljnim asocijacijama *Fagetum abietetosum* i *Blechno-abietum* Gorskog Kotara. [**Aerobic bacteria in the communities *Fagetum abietetosum* and *Blechno-abietum* of the Gorski Kotar.**] *Šum. List* 79 (9/10), 1955 (333–9). 17 refs. [Croat.croat. g.]

Both associations are poor in bacteria, *Blechno-abietum* being the poorer.

2402. WOLNIEWICZ-CZERWINSKA, K. Promieniowce z rodzaju *Streptomyces* ściółki i gleby lasu bukowego. [**Actinomycetes of the genus *Streptomyces* from the litter and soil of a Beech wood.**] *Acta Soc. bot. Polon.* 25 (1), 1956 (111–58). 27 refs. [Pol.e.] O.B.D.

Tables show the quantitative and qualitative occurrence of the actinomycetes in relation to soil and seasons on two sites (hill slope and stream valley) in the Beech reservation in Muszkowice, Wrocław district. The actinomycetes were more numerous on the hillside than in the valley. Greatest development took place in spring and summer. Of 54 species isolated, 17 are able to decompose cellulose, and 50 produced strong hydrolysis of starch. Most of the actinomycetes (77–88%) produced proteolytic enzymes, and relatively few species (ca. 40%) reduced nitrates. This phenomenon becomes comprehensible in the light of soil analyses which showed that $> 90\%$ of N in the soil is there in the form of albuminous compounds. *From author's summary.*

2403. FLORENZANO, G. Indagini microbiologiche sulla rinnovazione delle abetine di picea in Cadore. [**Microbiological studies on the regeneration of Spruce in Cadore.**] *Ann. Accad. ital. Sci. for.* 3, 1955 (169–99). 16 refs. [It.f.]

A study was made of soil samples and young Spruce regeneration (1–10 years) from S. Pietro di Cadore. Soil samples were taken from litter, humus, and mixed soil, and were analysed for the following characters: total aerobic and anaerobic microflora (divided into bacteria, actinomycetes, and true fungi); index of respiration in terms of CO_2 production; number of aerobic and anaerobic N fixers, and N-fixing capacity; ammonifying microflora and potential ammonifying capacity; number of nitrifiers and nitrifying capacity; number of pectinolytic and cellulolytic organisms and cellulolytic capacity. The analytical methods used are described and the results tabulated and graphed. The most striking characteristic of all soil samples was a considerable

power of ammonification and very poor nitrification, and the presence of numerous and active denitrifiers. Cellulolytic activity was very marked, especially in the upper layers of the profile. The disequilibrium between the activity of the principal physiological groups of the microflora in these soils is related to the abnormal sequence of phases in the N-regime, which in turn is probably due to the predominance of eumycetes. The Spruce seedlings examined for mycorrhizal infection were aged from 1 to 10 years and had developed on humus, on mineral soil or on litter and rotting wood. Plants growing on humus usually developed pseudomycorrhiza (type C), while the others usually developed true mycorrhizae of type B.

2404. VARGUES, H. Étude de quelques activités microbiennes dans les sols plantés d' *Eucalyptus*. **[Microbiological activity in soils planted with Eucalypts.]** *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord, Alger* 45 (7/8), 1954 (323–34). 8 refs. [F.] I.M.I.

An investigation of samples from (*a*) a 20-year Eucalypt plantation [species not given] on non-calcareous soil near Baïnem, Algeria, (*b*) controls (soil from a path and from under scattered Aleppo Pine), (*c*) from under 2- to 8-year roadside Eucalypts, and (*d*) controls on calcareous soil near Bou Medfa. In (*a*), though not in (*c*), the number of saprophytes was markedly less than in the controls. Virtually no *Azotobacter* were found in (*a*) and (*b*), but in (*c*) and (*d*) they were plentiful. In laboratory experiments, the addition of Eucalypt [leaf?] extract to a garden soil reduced the number of saprophytes considerably, and slowed down NO_2 production; it did not affect *Azotobacter* cultures. Reduction of moisture and the presence of an antibacterial substance are suggested as causes for the observed reduction of microbiological activity under Eucalypts.

2405. PRÉVOT, A. R., RAYNAUD, M., FISCHER, G., and BIZZINI, B. Recherches sur la ligninolyse bactérienne dans le sol. **[Studies on bacterial ligninolysis in the soil.]** *Trans. 5th int. Congr. Soil Sci., Léopoldville 1954* Vol. 3, 1955 (13–23). [F.f.e.] H.S.B.

The authors isolated 20 strains of *Pseudomonas* from forest soils, which were found to destroy up to 80% of phenol-lignin, amyl-lignin, and ammonia-lignin. Laboratory strains of *Pseudomonas* were found to have the same power.

2406. WELVAERT, W., and VELDEMAN, R. Schimmelflora van klei- en bosgrond. **[Fungus flora in clay and forest soil.]** *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 20 (2), 1955 (193–210). [Flem.flem.f.e.] H.S.B.

Fungi were isolated from samples taken at 6 levels each from forest loam (litter layer and to a depth of 60 cm.) and from a cultivated clay soil (depths of 5–60 cm.). Results are tabulated. In both, fungi were still relatively abundant at 60 cm. More species were present in the clay than in the forest soil where the flora consisted mainly of *Trichoderma*, *Penicillium* and Mucoraceae; this paucity of species in forest soils may be attributed to their lower pH values.

2407. THORNTON, R. H., COWIE, J. D., and MCDONALD, D. C. **Mycelial aggregation of sand soil under *Pinus radiata*.** *Nature, Lond.* 177 (4501), 1956 (231–2). 2 refs. [Soil Bureau, Wellington, N.Z.]

During a survey of the sand soils of Manawatu County, New Zealand, a difference was noted between Himatanga sand under Manuka scrub (*Leptospermum* spp.) and the same soil under *Pinus radiata*. Total porosity % was much the same, but the % of large pores was significantly greater under Pine ($24{\cdot}9 \pm 7{\cdot}8$ against $12{\cdot}3 \pm 10{\cdot}5$), and the soil also had a greater power of cohesion. It is considered possible that this difference may be due to the greater abundance of basidiomycete mycelia and hyphae in the soil under Pine.

2408. GOODNIGHT, C. J., and GOODNIGHT, M. L. **Some observations in a tropical rain forest in Chiapas, Mexico.** *Ecology* 37 (1), 1956 (139–50). 22 refs. [Purdue University, Indiana.]

A study of soil and litter fauna.

2409. SYS, C. L'importance des termites sur la constitution des latosols dans la région d'Elisabethville. **[The importance of termites in latosol formation in the Elisabethville region.]** *Sols africains, Paris* 3 (3), 1955 (392–5). [F.E.]

The termitaries here increase with the clay content of the soil from 2·7 to 4·9/ha., and cover from 4·3 to 7·8% of the area. Heights and diameters are 26–36 and 46–49 ft. respectively. Normal and termitary profiles are described and tables compare for each horizon: (*a*) the mechanical analyses; (*b*) pH; (*c*) exchangeable bases. The 'biological' soil has a higher clay content and higher values for (*b*) and (*c*).

114.7. Soil Surveys and Surveying

2410. PLAISANCE, G. Vers une cartographie pédologique forestière. **[Forest soil mapping.]** *Rev. for. franç.* 8 (2), 1956 (89–101 + 1 map). 12 refs. [F.]

Discusses the requirements of a forest soil map and the difficulties involved, with special reference to France, and gives a specimen sheet illustrating conventions for the representation of soil types and parent materials.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 2756–61, 2773–4, 2811, 3504, 3528, 3548.

2411. GRUNOW, J. Der Niederschlag im Bergwald. Niederschlagszurückhaltung und Nebelzuschlag. **[Precipitation in mountain forests. Its interception and its augmentation through fog drip.]** *Forstwiss. Cbl.* 74 (1/2), 1955 (21–36). 19 refs. [G.g.]

Measurements of precipitation were made over a number of years in stands (mainly Spruce, with some Fir and Beech) on different exposures in the Hohenplissenberg, in order to estimate interception on fog-free days and increase through drip on foggy

days. Interception depends on the kind and amount of the precipitation and its frequency. The proportion intercepted is compensated, or more than compensated, by the deposition of moisture from mist or fog. Over a year this fog-drip accounts, in the interior of a stand, for ca. 20%, and on the stand margin for 50% of the moisture reaching the forest floor. *From author's summary.*

2412. EIDMANN, F.-E. Untersuchungen über die Interzeption und den Abfluss an der Bodenoberfläche in Buchen- und Fichtenbeständen. **[Investigations into interception and surface run-off in Beech and Spruce stands.]** *Abstr.* in *Forsch. u. Berat. (Forstw.) Landesausschuss. landw. Forsch. Landes Nordrheins—Westfalen* No. 1, 1954 (104–9). [G.g.]

The paper tabulates monthly averages for total precipitation, interception, and surface run-off under both species for the period Nov. 1950–Oct. 1952, from 45 experimental plots in the district of Hilchenbach, Sauerland (annual precipitation 1200–1300 mm.). Transpiration was ignored. While total interception was 4% less under Beech in 1950–51 and almost equal for both species in 1951–52, monthly figures varied a good deal. Whereas in 1950–51 Beech intercepted somewhat less than Spruce, it intercepted appreciably more in the following winter, but again less in summer 1952. The most important factor was the amount of daily precipitation, particularly in summer, when interception by Spruce was considerably greater than by Beech in rainfalls up to 20 mm. whereas beyond this the figures were reversed. Run-off figures fluctuated even more widely. They were greater for Spruce in both summers and less in both winters, when Beech leaves on the ground tended to form a smooth close surface under light frost. Further detailed observations of all relevant factors are necessary. [Cf. *For. Abstr.* 17 (No. 1173).]

2413. IVERSEN, A.; OKSBJERG, E. Grundvandets betydning for hedeskovenes vandforsyning. **[The importance of groundwater in the supply of water to heathland plantations.]** *Dansk Skovforen. Tidsskr.* 40 (2; 3), 1955 (49–71; 134–9). [Dan.]

Iversen concludes from a calculation of total water consumption per ha. (based on data from Grindsted plantations of Norway Spruce, but using an interception factor derived from work by Hoppe in Austria in 1896 and a transpiration coefficient from work by Vater in Germany in 1923) that a large part (ca. ½ in 1929 and ca. ¼ in 1927) of the water consumed must be drawn from the groundwater. Oksbjerg considers the figures used inapplicable and the conclusions invalid.

2414. ZAHNER, R. **Soil water depletion by Pine and hardwood stands during a dry season.** *For. Sci.* 1 (4), 1955 (258–64). 11 refs.

The available water in the 6–12, 21–27, 36–42 and 54–60 in. zones under comparable stands of mixed Oaks and *Pinus taeda*/*P. echinata* in the Crossett Experimental Forest was measured weekly (2 June–8 Sept. 1954), all except the top zone being steadily depleted during that hot dry summer. Except for a week's lag under the Oaks, due probably to the greater storage capacity of the soil, there was little difference between the stands in rate of loss for corresponding depths. The data were therefore combined. Curves drawn from regressions for each zone show that the rates of loss from the third and fourth zones (below 3 ft.) were about half those of the first and second respectively. Between the 2nd June and the 14th July (a period of steady depletion in all zones) the rate of loss in both types was 0·19 in./day from the top 4 ft. of soil, confirming previous results in comparable conditions. The estimated loss of 0·25 in./day from the whole profile agrees with the potential evapotranspiration of the area from Thornthwaite's formula. These agreements support theories that evapotranspiration for a given climatic area is independent of the type of forest cover.

2415. GÖHRE, K. Lysimeterversuche über den Wasserhaushalt von unbewachsenem und mit jungen Eichen bewachsenem Boden. (Bericht über Messungen an der Lysimeteranlage in Eberswalde in den Jahren 1949–1953). **[Lysimeter researches on the water economy of bare soil and soil supporting young Oak. (Report on measurements made at the Eberswalde lysimeter installation, 1949–53.)]** *Arch. Forstw.* 3 (7/8), 1954 (645–74). 7 refs. [G.]

A detailed account of the variations observed in the factors of the equation: evaporation equals precipitation less deep seepage less change in water storage. The lysimeter boxes rested on scales accurate to 0·1 kg., and stopcocks allowed the drawing off or retention of seepage. The data cover weather (precipitation, temperature, humidity and wind speed), the monthly evaporation (including transpiration), the monthly water storage, soil moisture, monthly seepage, the relation between evaporation and the saturation deficit of the air, evaporation by day and by night and, for the Oak, leaf area, number of stomata, weight of dry substance and a comparison of the transpiration of Oak and Pine, with rainfall by months.

2416. FELDMANN, A. Wald und Wasser. Grundsätzliches zum Stand unseres Wissens. **[Forest and water. On the state of our knowledge.]** *Forst- u. Holzw.* 10 (9), 1955 (175–9). 23 refs. [G.]

The author reviews the problem on the basis of the general literature, distinguishing between the influence of forests on total annual stream flow and water levels, and on their seasonal fluctuations, and pointing to the difference in soil structure to explain the conflicting observations recorded for dry seasons. He discusses in greater detail the problems of the Ruhr region where fluctuations have steadily become much greater, and argues that though the afforestation of derelict scrub in the Sauerland over the last 150 years contributed to the depletion of water reserves, there is little evidence that Spruce forest consumes more water than hardwood high forest. Intensification of agriculture is adduced as a further factor in low water levels, while canalization and drainage, rather than the run-off from the raw humus accumulated under Spruce, is thought to be responsible for the high peaks.

2417. GORRIE, R. M. **The role of forests in Damodar Valley.** *Journal of Soil and Water Conservation in India, Hazaribagh* 2 (4), 1954 (164–71). C.G.B.

Chiefly a general discussion of the forest (mainly over-exploited Sal coppice) of the Chota Nagpur plateau, land use, forest protection against fire, grazing and, particularly, gully erosion, in connexion with the water regime of the Damodar catchment area. Species recommended for afforestation trials include *Eucalyptus tereticornis, E. resinifera, E. citriodora,* which have all done well in Hazaribagh, *Cassia siamea, Terminalia arjuna* and *Wendlandia exserta.*

2418. BERRY, M. J. **Erosion control on Bukit Bakar, Kelantan.** *Malay. Forester* 19 (1), 1956 (3–11 + 8 photos).

Describes the measures taken to control erosion on a denuded hillside and badly graded road, including gully-plugging, ridging with brushwood fascines, planting grasses, and the eventual introduction of leguminous tree species.

2419. MORRIS, J. Y. **Soil conservation practices in France.** *N.Z. J. For.* 7 (2), 1955 (12–25).

With particular reference to torrent training and the management of catchment areas.

2420. NISHI, R., and KIMURA, D. [**Studies on the tide-water control forests in South Kyushu.**] *Bulletin of the Faculty of Agriculture, Kagoshima University* No. 3, 1954 (61–79). [Jap.e.]

Coastal forests were effective in protecting inland areas from flood-tide damage caused by typhoon Ruth in 1951. Most of such forests in S. Kyushu are dominated by *Pinus thunbergii* in the upper storey, but it seems advisable to use broadleaved evergreens, e.g. *Eurya emarginata, Euonymus japonica, Pittosporum tobira, Raphiolepis umbellatus, Aucuba japonica* and *Ilex integra,* in the understorey. Protection against tidal damage increases in effectiveness with the width of the forest, but many belts of coastal forest only a few metres broad proved fairly effective against the 1951 typhoon. In some places a simple breakwater through the middle or along the landward side of the belt affords additional protection. *From authors' summary.*

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 2590, 3006 *et seq.*, 3393 *et seq.*

2421. THOMAS, J. B. **Notes on insects and other arthropods in Red and White Pine logging slash.** *Repr.* from *Canad. Ent.* 87 (8), 1955 (338–44). 16 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 234.)

About 140 species of insects and other arthropods were collected from the 100 collecting points on the study area. These are listed with annotations in 4 groups: (1) phloem and sapwood borers, (2) fungus, frass, and detritus feeders, (3) parasites, and (4) predators.

2422. REID, R. W. **The bark beetle complex associated with Lodgepole Pine slash in Alberta.** *Repr.* from *Canad. Ent.* 87 (7), 1955 (311–23). 14 refs. (*Contr. Div. For. Biol. Dep. Agric. Can.* No. 218.)

Notes on the seasonal history and habits of the most common barkbeetles attacking Lodgepole Pine slash, viz. *Ips perroti, I. pini, I. guildi, Pityogenes knechteli, Orthotomicus vicinus, Polygraphus rufipennis, Hylurgops rugipennis* and *Dendroctonus valens.*

2423. SCHMUTTERER, H. Aphiden und Cocciden als Honigtauerzeuger auf Laubhölzern. [**Aphidae and Coccidae as producers of honey-dew on deciduous trees.**] *Z. angew. Ent.* 34 (4), 1953 (607–12). 8 refs. [G.] I.I.E.

Brief notes on species found on Maple, Oak, Lime, Beech, Elm, Hazel, Hornbeam and Plum.

2424. NONVEILLER, G. Drugi prilog evropskoj bibliografiji o dudovcu. [**Second contribution to a European bibliography of *Hyphantria cunea.***] *Zašt. Bilja* No. 25, 1954 (105–9). 114 refs. I.M.I.

The first instalment of this bibliography appeared in *Zašt. Bilja* No. 16/17 (176).

2425. BOGAVAC, M. Broj guseničnih stadijuma kod dudovca. [**The number of larval stages in *Hyphantria cunea.***] *Zašt. Bilja* No. 25, 1954 (76–83). 7 refs. [Croat.e.] I.M.I.

Gives data on number and duration of the stages, and on mortality, for larvae artificially reared, singly or in groups. Ecdysis occurred 6–8 times and is possibly affected by temperature. The duration of the stages of larvae reared singly was unequal and their mortality was high especially in the first and second stages; those reared in groups did not show such inequality and their mortality was low.

2426. VASIĆ, K. Prilog poznavanju životnog ciklusa nekih vrsta sovica iz rodova *Triphaena* O. i *Spaelotis* Bsd. [**Life cycle of some moth species of the genera *Triphaena* and *Spaelotis.***] *Glasn. šum. Fak., Beograd* No. 8, 1954 (31–9). 7 refs. [Serb.f.]

Presents results of a comparative study on the life cycles of *T. pronuba, T. orbona, T. comes, T. fimbriata* and *S. ravida,* all found in Jugoslavia.

2427. SMITH, S. G. **Chromosomal polymorphism in a bark weevil [*Pissodes approximatus*].** *Nature, Lond.* 177 (4504), 1956 (386). 3 refs. [Forest Insect Laboratory, Sault Ste. Marie, Ont.]

2428. ŽIVOJINOVIĆ, S. Prilog poznavanju Scolytidae planine Maljena. [**Scolytidae of Mt. Maljen.**] *Glasn. šum. Fak., Beograd* No. 8, 1954 (3–29). 7 refs. [Serb.e.]

Describes 36 species of Scolytidae, and conditions favouring their outbreaks.

2429. CHAPMAN, J. A. **Interpretation of adult history in the ambrosia beetle, *Trypodendron.*** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (3–4).

Notes on the biology of *T. lineatum.*

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 2918, 2929, 2986 *et seq.*, 3022, 3174, 3504.

2430. RABELER, W. Die Artenfolge in den Vogelbeständen der Oberharzer Fichtenforsten. **[The succession of species in bird populations of Norway Spruce plantations in the Upper Harz.]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 5, 1955 (193–7). 15 refs. [G.]

Tabulates and discusses the results of studies made on 5 plots in pure Spruce plantations varying from 6 to 90 years old.

2431. JOHNSTON, D. W., and ODUM, E. P. **Breeding bird populations in relation to plant succession on the Piedmont of Georgia.** *Ecology* 37 (1), 1956 (50–62). 27 refs. [University of Georgia.]

A study was made on 4 adjacent types: (1) grassland, (2) shrubland, (3) Pine forest, (4) hardwood forest (Oak/Hickory). It was found that breeding-bird populations increased in that order, except for a falling-off in (3). Birds are particularly important during the transition from grassland to forest, in determining to what extent a shrubland stage will develop.

2432. DANIEL, T. W. **Rodent population of the Spruce-Fir type of Logan Canyon [, Utah].** *Proc. Utah Acad. Sci. 1954/55*, 32, 1955 (35–6). A.P.B.

Presents the results of counts made in 3 successive years in felled and unfelled areas.

2433. PEDERSEN, C. Bestandssvingninger hos danske markmus. **[Population variations of *Microtus agrestis* and *M. arvalis* in Denmark.]** *Dansk Skovforen. Tidsskr.* 40 (9), 1955 (414–31). 7 refs. [Dan.]

Data from articles in literature (1875–1954), from management records for state forest districts (ca. 1910–1940), and from answers to questionnaires, are used to determine years of maximum infestation; these occur at 2- to 7-year intervals. Maxima for N. Sjæland and S. Jutland are not identical. This suggests that factors other than climate may be involved.

2434. KUWAHATA, T. **[Studies on the distribution of field mice in Hokkaido. (8) Note on the fluctuation of the population density under the natural Todo-Fir forest at Nopporo.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 79, 1955 (71–92). 22 refs. [Jap.jap.e.] (Also in *Rep. For. Exp. Sta., Hokkaido* No. 5, 1955 (1–22).)

Report on a study carried out in 5 plant communities of *Abies sachalinensis* forest, on *Clethrionomys bedfordiae*, *Apodemus geisha*, *A. ainu ainu*. [Cf. *For. Abstr.* 16 (No. 3157).]

2435. BASKETT, T. S. **Experimental trials of wildlife food and cover plants [in Missouri].** *Res. Bull. Mo. agric. Exp. Sta.* No. 584, 1955. pp. 24. 26 refs.

16. General Botany

160. Plant Chemistry

See also Nos. 2383, 2386, 2447, 2540–1, 2543, 2785, 2915, 3043, 3083, 3209, 3240 *et seq.*, 3358, 3473 *et seq.*

2436. OVINGTON, J. D. **The composition of tree leaves.** *Forestry* 29 (1), 1956 (22–8). 14 refs.

Leaves were collected from 3 series of forest plots, each series with a wide range of tree species established on a fairly uniform soil type, some species being common to all plots. The contents of Na, K, Ca, Mg, Fe, Mn, Si, P, C, N, and ash are tabulated for leaves of *Castanea sativa*, *Quercus robur*, *Q. rubra*, *Q. sessiliflora*, *Nothofagus obliqua*, *Fagus sylvatica*, *Abies grandis*, *Larix decidua*, *L. eurolepis*, *Chamaecyparis lawsoniana*, *Picea abies*, *P. omorika*, *Pinus nigra*, *P. sylvestris*, *Thuja plicata*, *Pseudotsuga taxifolia*, and *Tsuga heterophylla*. The chemical compositions of the leaves are related to soil conditions and to the tree species selected for afforestation. When hardwood leaves were compared with softwood leaves, some consistent differences in chemical composition emerged between the two groups at all 3 localities. The ecological and silvicultural applications of foliar analysis are considered.

2437. HOERING, T. **Variations of nitrogen-15 abundance in naturally occurring substances.** *Science* 122 (3182), 1955 (1233–4). 5 refs. [University of Arkansas, Fayetteville.] O.R.S.

The substances studied include leaves of Red Oak, Cedar [*Juniperus virginiana*?] and American Elm.

2438. KRITCHEVSKY, G., and ANDERSON, A. B. **Chemistry of the genus *Sequoia*. I. The cone solid of coast Redwood (*Sequoia sempervirens*) and Giant Sequoia (*Sequoia gigantea*).** *Repr.* from *Journal of Organic Chemistry, Baltimore* 20 (10), 1955 (1402–6). 7 refs.

Pyrogallol, catechol, phloroglucinol, gallic acid, and protocatechuic acid appear to be among the degradation products of the cone solids ['cone crystals'] of the two species. These compounds, with the possible exception of catechol, also occur in the free state in the cone solids. No sugars were detected among the hydrolysis products. *Authors' summary.*

2439. TALLENT, W. H., STROMBERG, V. L., and HORNING, E. C. ***Pinus* alkaloids. The alkaloids of *P. sabiniana* Dougl. and related species.** *J. Amer. chem. Soc.* 77 (23), 1955 (6361–4). 14 refs. O.R.S.

Leaves of 9 species (*P. attenuata*, *P. coulteri*, *P. jeffreyi*, *P. monophylla*, *P. pinceana*, *P. radiata*, *P. remorata*, *P. sabiniana* and *P. torreyana*), among 27 species examined, were found to contain alkaloids. Pinidine was found in *P. sabiniana*, *P. jeffreyi* and *P. torreyana*. The significance of these results in relation to Mirov's biochemical classification of Pines [see *For. Abstr.* 15 (No. 970)] is discussed. A detailed study of the leaves of *P. sabiniana* showed that (+)-α-pipecoline was also present, and that pinidine has an empirical formula $C_9H_{17}N$.

2440. PLOUVIER, V. Nouvelles recherches sur le pinitol des Légumineuses. Sur la présence de *d*-quercitol dans le *Pterocarpus lucens*. **[New investigations on pinitol in Leguminosae. The presence of *d*-quercitol in *P. lucens*.]** *C.R. Acad. Sci., Paris* 241 (24), 1955 (1838–40). 3 refs. [F.] O.R.S.

Pinitol was found in Mimosoideae (*Acacia seyal*), Caesalpinioideae (*Cercis siliquastrum, Bauhinia aurea, Caesalpinia bonducella*), and some Papilionatae (including *Sophora japonica, Laburnum anagyroides, Robinia* spp., *Dalbergia sissoo, Pterocarpus erinaceus* and *P. soyauxii, Lonchocarpus laxiflorus*, but not *Dalbergia melanoxylon, Pterocarpus lucens, P. mildbraedii*, or *Lonchocarpus griffonianus*); *d*-quercitol was isolated from twigs and leaves of *P. lucens*.

2441. SHIBAMOTO, T., SHOJI, R., and KUBOTA, S. **[Studies on some properties of stem and shoot of Bamboo (*Phyllostachys edulis* Riv.) (No. 2). Variations of chemical constituents through growth.]** *Bull. Tokyo Univ. For.* No. 48, 1955 (203–7). 3 refs. [Jap.jap.e.]

Up to 7–10 days from sprouting, the chemical composition of the shoot is quite different from that of the stem, but at 20 days the contents (except N) are nearly the same. Stems cut in February and June contain more matter soluble in water and less matter soluble in 2% HCl than stems cut in September. Graphs and tables have English titles and legends.

2442. SHIBAMOTO, T., SHOJI, R., and TAGAWA, K. **[Studies on some properties of stem and shoot of Bamboo (*Phyllostachys edulis* Riv.). (No. 3). On nitrogenous matters in shoot of Bamboo.]** *Bull. Tokyo Univ. For.* No. 48, 1955 (209–20). 5 refs. [Jap.jap.e.]

Lists 19 amino-acids occurring, or probably occurring, of which 9–12 were found in a free state in each sample. In shoots less than 5 days above ground, proline was present; after 5 days, threonine. Total N was greater in fresh than in dry samples. Total N was high in young stages and in the top parts of stems. Graphs and tables have English titles and captions. [Cf. preceding abstract.]

2443. VIRTANEN, A. I., and KARI, S. **Free amino acids in pollen.** *Acta chem. scand.* 9 (9), 1955 (1548–51). 6 refs. [E.] [Biochemical Institute, Helsinki.] O.R.S.

The composition of the free amino-acid fraction in the pollen of 9 wind-pollinated plants was studied by paper chromatography. The main results were as follows: (1) There was much more free proline in the pollen than in the green parts of the plants. (2) Free hydroxyproline, rare in plants, was found in the pollen but not in the green parts of *Alnus incana, Corylus avellana, Betula alba* and *Salix caprea*. (3) Pipecolic acid was found in pollen of *A. incana, C. avellana, Quercus robur, B. alba, Salix caprea* and *Secale cereale* but not in their green parts. (4) Citrulline, present in noticeable and in large amounts in leaves of *A. incana* and *C. avellana* respectively, was not found in the pollens nor was it found in the other plants investigated, except in small amounts in both leaves and pollen of *B. alba*. (5) The quantity of free basic amino-acids was much higher in the pollen than the leaves of e.g. *B. alba, Populus tremula, Q. robur* and *Pinus sylvestris*; a noticeable increase in amides (asparagine or glutamine or both) was also often found in the pollen.

2444. HATANO, K. **The amino acids in the pollen and female flower of *Pinus thunbergii*.** *Bull. Tokyo Univ. For.* No. 48, 1955 (149–51). 5 refs. [E.]

Fifteen amino-acids from the pollen are named and 14 of these occur in the female flowers. Free arginine, glutamic acid, and proline are abundant in the pollen. *P. densiflora* pollen is similar in composition. [Cf. *For. Abstr.* 15 (No. 2250).]

161. Physiology

See also Nos. 2414–5, 2455, 2459, 2536 *et seq.*, 2915–6, 2945, 2963, 3064–5, 3067, 3219–20.

2445. LAWRENCE, W. J. C. **Techniques for experiments with pot plants.** *Plant & Soil* 6 (4), 1955 (332–46). 10 refs. [John Innes Horticultural Institution.]

A review of the variations in environmental factors normally encountered and a detailed description of standardized techniques suitable for the assessment of the quantitative and qualitative results required by the geneticist, plant breeder and physiologist.

2446. BARNER, J. Der tageszyklische Verlauf von Assimilation und Atmung im Lichte stoffproduktionsanalytischer Vergleichsuntersuchungen. **[The daily course of assimilation and respiration in the light of comparative analyses of organic-matter production.]** *Ber. dtsch. bot. Ges.* 68 (7), 1955 (271–4). O.B.D.

Investigations were made on two Poplar clones on a site where it was possible to regulate the water-table artificially. Over a period of 5 days the water-table was lowered, and on the sixth restored to its normal level, while records were kept of assimilation and respiration. The discovery of a difference in the reaction of the two clones over the period, one showing a lower total production of organic material, suggests that such methods might be adopted to investigate the site requirements of different clones.

2447. GUNDERSEN, K. Klorofyl og kvælstof i årsskud af unge gødede og ugødede askeplanter samt klorofyl i årsskud af bøg. **[Chlorophyll and N in annual shoots of Ash with or without application of fertilizer, and chlorophyll in annual shoots of Beech.]** *Dansk Skovforen. Tidsskr.* 39 (5), 1954 (238–42). 2 refs. [Dan.e.]

Amounts of chlorophyll in the bark of annual shoots of Ash ranged from 0·8 to 1·4 mg./50 sq. cm. bark surface area. N expressed as % by weight of dry matter ranged from 0·77 to 0·85% in shoots with buds removed and from 1·55 to 1·71 for the buds alone. There were no significant differences in chlorophyll or N content between plants treated with fertilizer and untreated controls, but as the shoots on treated plants were longer, absolute values were higher than for the untreated plants. Chlorophyll amounts in the bark of annual shoots of 10 ten-year Beech trees were of a similar order (0·48 to 1·22 mg./

50 sq. cm. bark surface); 7 to 15 mg./100 g. fresh weight were also found in their wood.

2448. McDERMOTT, R. E., and FLETCHER, P. W. **Influence of light and nutrition on color and growth of Redcedar [*Juniperus virginiana*] seedlings.** *Res. Bull. Mo. agric. Exp. Sta.* No. 587, 1955. pp. 15. 14 refs.

During the 1953 growing season, 1 + 0 seedlings of *J. virginiana* were grown under three light intensities, (*a*) full sunlight, (*b*) $\frac{1}{3}$ sunlight, and (*c*) $\frac{1}{10}$ sunlight, and varying fertilizer levels of N, Ca, P, and K. At the close of the growing season, it was clear that fertilizers did not affect growth or coloration of foliage at any light intensity. Growth responses in (*a*) and (*b*) were the same, but (*c*) resulted in seedlings that were deficient in both height and top/root weight ratio. During the summer, foliage of (*a*) seedlings was yellow-green, of (*b*) pure green, and of (*c*) blue-green. In the autumn, (*a*) developed a strong anthocyanin pigmentation and (*b*) a pronounced yellow-green, while (*c*) remained unchanged. It seems evident that the autumnal colouring of *J. virginiana* is essentially a light phenomenon, though the degree to which red or yellow colour is developed is primarily governed by genetic factors. *From authors' summary.*

2449. FENSOM, D. S. **Effect of synthetic growth regulators on the electrical potentials of Red Pine trees.** *J. For.* 53 (12), 1955 (915–6). 5 refs.

A survey has been made in Canada of *Pinus resinosa* trees sprayed with synthetic growth regulators in spring 1950. Readings of electrical potentials were taken twice a year from Sept. 1950, covering in all a period of 4 summers. The growth regulators, used as sprays in various concentrations, were 2,4-D, NAA (naphthalene-acetic acid), and TIBA (tri-iodobenzoic acid). Experimental procedures are described and results discussed. The most extensive spraying was done with 2,4-D at concentrations of 100–10,000 p.p.m. and the results are graphed. At the lowest concentrations the potentials were greater than those of controls, but as the concentration rose, the potentials gradually dropped and reversal in polarity eventually took place. NAA and TIBA sprays in concentrations of 100 and 200 p.p.m. caused no gross observable change in the trees nor any significant pattern in the electrical stem potentials. [Cf. *For. Abstr.* 13 (No. 2770).]

2450. KROG, J. **Notes on temperature measurements indicative of special organization in arctic and subarctic plants for utilization of radiated heat from the sun.** *Physiol. Plant., Copenhagen* 8 (4), 1955 (836–9). 4 refs. [E.] [Arctic Health Research Centre, Anchorage, Alaska.]

Temperature inside catkins of *Salix polaris* was measured by fine needle thermocouples in bright sunlight in Alaska. With air temperatures at about freezing point, temperature inside the catkins was 15–20° C. higher. An attempt is made to explain this high efficiency in heat absorption, which was not expected in view of the light colour of the catkins.

162. Pathology. Teratology

2451. MEYER, D. E. Weiteres über unterirdisches Blühen und blasse Individuen bei Orchideen, sowie über blasse *Salvia* und *Quercus*. **[Underground flowering and chlorophyll-deficiency in orchids, also chlorophyll-deficient Salvias and Oaks.]** *Ber. dtsch. bot. Ges.* 68 (8), 1955 (352–64). 20 refs. [G.] O.B.D.

Includes notes on chlorophyll-deficient Oak seedlings found in mixed *Quercus robur* and *Q. borealis* stands.

163. Embryology

See also Nos. 2567, 2574.

2452. LARUE, C. D. **Studies on growth and regeneration in gametophytes and sporophytes of gymnosperms [with discussion].** *Brookhaven Symposia in Biology, Brookhaven National Laboratory, Upton, N.Y.* No. 6, 1954 (187–208). 31 refs. (*Paper, Department of Botany, University of Michigan* No. 999.) L.S.

Reports on the development of a very slow-growing callus tissue from the megagametophyte of *Thuja occidentalis*, on germination trials with pollen grains of 20 gymnosperm species, including *Taxus cuspidata*, *Cupressus funebris*, and *Juniperus monosperma*, and the rooting of *Podocarpus macrophyllus* leaves in peat.

2453. SYMON, D. E. **Polyembryony in *Cassia*.** *Nature, Lond.* 177 (4500), 1956 (191). 2 refs. [Waite Agricultural Research Institute, Adelaide.]

An examination of seeds of different species of *Cassia* has shown the occurrence of polyembryony to be geographically widespread and remarkably common in several species.

164. Morphology

See also Nos. 2499, 2501, 2585–6.

2454. SACHER, J. A. **Dwarf shoot ontogeny in *Pinus lambertiana*.** *Amer. J. Bot.* 42 (9), 1955 (784–92). 34 refs. O.B.D.

Cf. *For. Abstr.* 16 (No. 1410).

2455. SZYMAŃSKI, S., and SZCZERBIŃSKI, W. Pączki jako wskaźnik potencjału życiowego młodej sosny. **[Buds as indicators of the vigour of young Pines.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (275–304). 9 refs. [Pol.pol.russ.e.]

The size and number of buds in young *Pinus sylvestris* decrease from the apex downwards and from the distal to the proximal end of every shoot. In every tree the length increment of shoots is proportional to the length of the buds.

2456. BLASER, H. W. **Morphology of the determinate thorn-shoots of *Gleditsia* [*triacanthos*].** *Amer. J. Bot.* 43 (1), 1956 (22–8). 28 refs. O.B.D.

2457. SHIMAJI, K. **On the vascular system of the node and leaf of genus *Quercus*.** *Bull. Tokyo Univ. For.* No. 48, 1955 (139–47). 8 refs. [E.e.jap.]

Q. suber and 15 Japanese species, all of the subgenera *Cyclobalanopsis* and *Lepidobalanus*, are covered. All had a stereotyped trilacunar node with 2/5 phyllotaxis, but two trends of vascular

specialization in the petiole and lamina, parallel with the two major types of wood anatomy [cf. *For. Abstr.* 16 (No. 4477)], were established.

2458. GATHY, P. Les feuilles de *Larix*, étude anatomique. [**The needles of *Larix* species: an anatomical study.**] *Cellule, Louvain* 16 (3), 1954 (329–53 + 2 plates). 25 refs. [F.f.] L.S.

Surveys the literature and describes, illustrates, and tabulates the characteristics of the needles of various races and provenances of *L. decidua*, *L. leptolepis* and *L. eurolepis*, both for long terminal and short secondary shoots.

2459. MEIDNER, H. **The determination of paths of air movement in leaves.** *Physiol. Plant., Copenhagen* 8 (4), 1955 (930–5). 7 refs. [E.e.] [Botany Department, University of Natal, Pietermaritzburg.]

Describes two instruments with which it is possible to assess qualitatively the paths of air movement available in a leaf. Results obtained with leaves of several species (*Erythrina caffra*, *Psychotria capensis*, *Scolopia mundtii*, *Canthium spinosum*, *Mangifera indica*, *Dalbergia obovata*, and *Chaetacme aristata*) indicate that the air-space systems are not continuous in all leaves, and that the degree of continuity of the air-space system appears to be related to the total stomatal pore area per sq. mm. as well as to the habitat (sun or shade) of a plant.

2460. SAARNIJOKI, S. Anatomisch-morphologische Untersuchungen über die Schlitzblättrigkeit bei einigen Bäumen und Sträuchern. [**Anatomical-morphological studies on cut-leavedness in some trees and shrubs.**] *Commun. Inst. for. Fenn.* 44 (2), 1955. pp. 118. 44 refs. [G.fi.]

Deals with *Corylus avellana*, *Ulmus montana*, *Tilia platyphyllos*, *Ribes nigrum*, *Acer platanoides*, *A. saccharinum*, *Caragana arborescens*, *Sambucus racemosa* and *S. nigra*.

2461. TRUCHANOWICZ, J. Różnice w kształcie liści drzew z dolnej, środkowej i górnej części korony. [**Differences in the shape of tree leaves from the bottom, medium, and top part of the crown.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (121–63). 5 refs. [Pol.pol.russ.e.]

Presents results of measurements of leaves of *Betula oycoviensis* × *B. verrucosa* (*A*), *Ulmus laevis* (*B*), *Fagus sylvatica* (*C*), *Tilia cordata* (*D*), and *Quercus robur* (*E*), taken from the bottom (*a*), centre (*b*) or top (*c*) of the crown. Differences in size and shape were observed for all species measured, the differences being markedly directional in nature for (*A*), (*B*) and (*D*), less so for (*C*), and not at all for (*E*). Except with (*E*), the leaves became shorter from (*a*) to (*c*); (*E*) had longest and broadest leaves at (*b*). Trends of other characteristics are given for each of the 5 species.

2462. MIŁKOWSKA, A. Z badan biometrycznych nad liśćmi wiązu szypułkowego (*Ulmus laevis* Pall.). [**Biometric studies on the leaves of *U. laevis*.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (97–120). 5 refs. [Pol.pol.russ.e.]

Passing from the proximal to the distal end of a short shoot, the leaves become longer, relatively narrower, and more acute at the base, while the widest part is found higher up the blade. Differences in the size and shape of leaves on a *U. laevis* shoot are brought about both by the innate peculiarities of form and by the uneven growth of the blade. The growth of the first and second leaves of the short shoot stops earlier than that of the third and fourth leaves.

2463. ZANOWA, M. Obserwacje nad ułożeniem liści u siewek wiązu. [**Observations on the phyllotaxy of Elm seedlings.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (473–8). 10 refs. [Pol.]

Reports observations on *Ulmus laevis*, *U. scabra*, *U. foliacea*, *U. pinnato-ramosa* and *U. elliptica*.

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 2366, 2499, 2520, 2536, 2585–6, 2966, 2980, 3209, 3213, 3226.

2464. WRIGHT, J. W. **A bibliography on forest genetics and forest tree improvement 1954.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 77, 1955. pp. 41.

Contains 363 references, mainly from N. America, Europe and Japan, arranged alphabetically by authors, with a subject index.

2465. CHIARUGI, A. Citogenetica forestale. [**Forest cytogenetics.**] *Ann. Acad. ital. Sci. for.* 3, 1955 (27–77). Many refs. [It.f.]

Discusses the application of cytogenetics to forest tree breeding.

2466. **Proceedings, Lake States Forest Genetics Conference, August 30–31, 1955.** *Misc. Rep. Lake St. For. Exp. Sta.* No. 40, 1955. pp. 108.

[Cf. *For. Abstr.* 15 (No. 2274).] Contains a large number of short papers by different authors on: recent progress in forest genetics by firms and institutions in U.S.A. and Canada; techniques related to research in forest tree improvement (problems of seed and pollen collection, storage and exchange; vegetative propagation; statistical methodology in forest tree improvement; testing for resistance to diseases and insects); and activities of the Lake States Forest Tree Improvement Committee. Individual papers include the following: Greenhouse grafting of Spruces and hard Pines at the Petawawa Forest Experiment Station (*M. J. Holst*); Scion storage and graft protection in the spring grafting of Red Pine (*M. J. Holst*); New vegetative propagation methods for Aspen and White Pine (*C. Heimburger*); Breeding for high-quality wood (*H. L. Mitchell*).

2467. MITCHELL, H. L. **Plans for research on forest genetics at the Forest Products Laboratory.** *Tappi* 39 (1), 1956 (26*A* . . . 58*A*). 16 refs. P.R.

Discusses the main subjects of current and proposed research at Madison: seed selection, vegetative propagation, breeding, and questions of wood quality.

2468. SCHOENIKE, R. E. **Plastic tubes for controlled pollination of Pine.** *J. For.* 54 (2), 1956 (135).

Details the advantages, and illustrates the use, of tubes (such as are used for packing tooth brushes) made of cellulose acetate butyrate, available in lengths of 6–12 in. and diameters of 0·5–2 in.

2469. MERGEN, F., ROSSOLL, H., and POMEROY, K. B. **How to control the pollination of Slash and Longleaf Pine.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 58, 1955. pp. 14. 1 ref.

A description of the technique, with illustrations of the various steps, e.g. isolation of ♀ flowers, collection of ♂ catkins, extraction of pollen, and pollination, including equipment and records. [Cf. *For. Abstr.* 17 (No. 1235).]

2470. GAUSSEN, H. Parenté réelle et pseudo-parenté de convergence. **[Genuine relationships [among conifers] and the pseudo-relationship of convergence.]** *C.R. Acad. Sci., Paris* 241 (24), 1955 (1678–80). 2 refs. [F.] O.R.S.

Examples are cited among conifers. *Larix* and *Pseudotsuga*, descending from a common ancestor, show a genuine relationship, but this is too distant to permit hybridization. *Cedrus*, *Larix*, *Pseudolarix* and *Pityites* show a convergence of form closer than that of any of them with their common ancestor *Pinus*. *Abies*, *Pseudotsuga*, *Keteleeria*, *Picea* and *Tsuga* show convergence in their common absence of vegetative mesoblast. Fertile hybrids exist between *Picea* and *Tsuga*, and *Keteleeria* and *Tsuga*. Conclusions drawn are that hybridization is possible when embryonic characteristics are similar, irrespective of differences between adult characteristics; these latter may be considered to be 'dormant' at the time of fertilization.

2471. WRIGHT, J. W. **Species crossability in Spruce in relation to distribution and taxonomy.** *For. Sci.* 1 (4), 1955 (319–49). 77 refs. [North-eastern Forest Experiment Station, U.S. Department of Agriculture.]

The results of 6 years' work show that, of 70 interspecific combinations (excluding reciprocals) 16 were successful, 12 doubtful and 42 failed. Of the first, 14 involved species morphologically similar or from neighbouring ranges or both. Of the last, 37 involved species morphologically distinct and from widely separated ranges. Detailed range maps are given and the comparative morphology of 31 species is tabulated. From this a table is compiled showing the number of characters by which each species differs from each of the others, a method that indicates that previously recognized sections are artificial. From the range, and from genetic and morphological data it is concluded that *P. glauca*, *P. engelmannii*, *P. pungens* and *P. sitchensis* have a common, relatively recent origin and are probably related to Old-World species through *P. jezoensis* of Japan. *P. mariana* and *P. rubens* are closely related. *P. abies*, *P. koyamai* and the complexes *P. asperata* and *P. likiangensis* are closely related, with a relatively recent common origin. Morphologically *P. obovata* does not seem to be the parent of *P. abies* as the distribution and crossing data would otherwise indicate. Each of the 6 Japanese species is most similar to different south-China species. Morphologically 6 different origins are indicated and they live sympatrically without apparent crossing. The origin of the genus was probably in north-east Asia with *P. koyamai* as possibly the oldest type. Crossability barriers appear to have arisen mainly from genic differentiation following isolation. Introgression is observable in western North America and in eastern Europe now, and has probably played a significant role in the past.

2472. PRIEHÄUSSER, G. Über den Formenkreis der Fichte in ursprünglichen Beständen des Bayrischen Waldes nach den Zapfen- und Zapfenschuppenformen. **[The grouping of forms of Spruce occurring in the indigenous stands of the Bavarian Forest, based on the form of cones and cone scales.]** *Z. Forstgenet.* 5 (1), 1956 (14–22). 6 refs. [G.g.e.f.]

From the form of the cone-scales from the middle portion of the cone, and two indices, viz. (1) ratio of maximum width to length, and (2) ratio of the distance of maximum width from the apex to length, not only the 6 known variants of *Picea abies*, but also intermediates of at least 2 basic forms have been determined with certainty. The form of the scales and the index values were useful in establishing the frequency and distribution of the basic forms and their intermediates in both indigenous and artificial stands of *P. abies*. The results are presented of observations on indigenous stands between Mt. Arber (1455 m.) and Mt. Falkenstein (1313 m.). These reveal a striking similarity in the distribution and frequency of the basic forms and their intermediates within the geographical zoning towards the northern boundaries and the altitudinal zoning between 600 and 1455 m. in the Bavarian Forest. *From author's summary.*

2473. WRIGHT, J. W. **Cone characteristics and natural crossing in a population of F_1 Pine hybrids.** *Z. Forstgenet.* 5 (2), 1956 (45–8). 5 refs. [E.e.g.f.]

Artificial *Pinus densiflora* × *P. sylvestris* and *P. thunbergii* × *P. densiflora* hybrids were raised from seed in 1940 and planted out in 1945. Studies of cone characteristics in 1948, when there was heavy fruiting, showed the hybrids to be intermediate between their parents, but the early fruiting of *P. densiflora* was dominant. Open-pollinated cones were collected from this plantation of hybrids and parent species in 1948 and the resulting seedlings studied for vegetative characteristics in 1951. More than half proved to be back-crosses. At the age of 3 years, both the back-crosses and F_1 progeny showed considerable vigour. *From author's summary.*

2474. TODA, R. **On the crown slenderness in clones and seedlings.** *Z. Forstgenet.* 5 (1), 1956 (1–5). 8 refs. [E.] [Government Forest Experiment Station, Miyazaki Sub-branch, Zinguumati, Miyazaki.]

[Cf. *For. Abstr.* 15 (Nos. 3879–80).] In studies on European Larch, using the formula that shows the relationship between stem (D) and crown (S) diameters of a tree:

$$\log S = K_s + C \log D,$$

it became clear that there is no constant value of the

coefficient *C* in different species, and that, therefore, the 'spacing value', previously proposed by the author, cannot be used as a method of description of crown slenderness of a tree. Seedlings arising from self-pollination have, when they are young, much broader crowns compared with the mother clone, and the difference diminishes as the seedlings develop. The difference of crown slenderness seems to be an expression of juvenility. Unexpectedly large variance, the nature of which is discussed, was found within the same clone, and it is concluded that abnormality of growth habit is correlated with increased crown diameter. This abnormality occurs also in grafted trees and does not seem to be caused by environmental factors, but to be innate in the scion wood used. Variations within a clone may always include such non-genetic innate variation, so the clonal test must be considered as of approximate value only. *From author's summary.*

2475. SOEGAARD, B. Fem søskendebestøvninger i europæisk lærk: en undersøgelse af nedarvningsforholdet for stammeformen i afkom af Tinghuslærken. **[Controlled pollination of five sister trees of European Larch: an investigation of stem-form inheritance in offspring of Larch from Tinghus.]** *Forstl. Forsøgsv. Danm.* 21 (4), 1954 (435–47). 5 refs. [Dan.e.]

Five mother trees were selected from the offspring of Larch open-pollinated in 1933 at Tinghus, and another tree from the same sowing was used as the father tree. One of the mother trees, S.76[4], was of bad stem form. Controlled pollination was carried out in 1942, sowing in 1943, transplanting in 1944 and planting out at 2·5 × 2 m. in 1945. Height and stem form of 50 trees each were measured in 1952. Offspring of the 4 mother trees with good stem form contained an average of 41·5% trees of good and 8·5% of bad stem form. Corresponding figures for the offspring of S.76[4] were 32 and 18. Photographs illustrate the similarity in form of mother trees and progeny.

2476. EDWARDS, M. V. **The hybrid Larch, × *Larix eurolepis* Henry.** *Forestry* 29 (1), 1956 (29–43). 24 refs.

The history of the Japanese and European parents of the Dunkeld hybrid Larch is surveyed fully from published records, and the descriptions of the F_1 hybrid summarized. Other relevant data on × *L. eurolepis* are surveyed. An experiment carried out on the progeny of the Dunkeld Larch to determine its characteristics and variability is described, both in the nursery and up to the 3rd year in the forest. *Author's summary.*

2477. GRAVES, A. H., and NIENSTAEDT, H. **Chestnut breeding. Report for 1953.** *Repr.* from *Rep. Nth. Nut Growers' Ass. 1953* [1954?] (136–44).

Includes notes on the pollen receptivity of ♀ flowers of *Castanea* spp., the effect of emasculation on nut yield, and vegetative propagation.

2478. NIENSTAEDT, H. **Receptivity of the pistillate flowers and pollen germination tests in genus *Castanea*.** *Z. Forstgenet.* 5 (2), 1956 (40–5). 7 refs. [E.e.g.f.] [Lake States Forest Experiment Station, St. Paul.]

The period of pollen receptivity of 2 Japanese, 2 Chinese and 2 hybrid Chestnuts was studied. All the trees were protandrous, and the ♀ flowers did not become fully receptive until 5–13 days after the beginning of the anthesis of the ♂ catkins. Most trees remain fully receptive for a week or more, though there are considerable variations between individuals. Chinese Chestnut have a rather long receptive period. According to the results of these experiments pollination is best performed between the 10th and 13th day after the beginning of the anthesis of the ♂ catkins. Emasculation does not injure ♀ flowers, but bagging with kraft paper bags does cause some reduction in nut yield. It may be advisable to use bags permitting more light penetration and air circulation. Pollen was successfully germinated in drops of distilled water or in a sucrose solution on microscope slides, using Petri dishes as moist chambers, at temperatures between 28° and 37° C. *From author's summary.*

2479. BIAŁOBRZESKA, M. **Właściwości morfologiczne i biologiczne brzozy ojcowskiej, brzozy brodawkowatej i ich mieszańca. [Morphological and biological characteristics of *Betula oycoviensis*, *B. verrucosa*, and their hybrid.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (165–89). 11 refs. [Pol.pol.russ.e.]

The hybrid (*A*) had leaves resembling *B. verrucosa* (*B*), whereas its seeds resembled those of *B. oycoviensis* (*C*); the catkin scales partook of both (*B*) and (*C*). The germinative capacity increased in the order (*C*), (*B*), (*A*). The short shoots of all three retain the ability to produce an inflorescence for one growth period only.

2480. MILJANOVSKIĬ, E. S. Nekotorye zamečanija po povodu statji F. S. Pilipenko 'Novye dannye o vido- i formoobrazovanii èvkalipta'. **[Remarks on the paper 'Fresh data on the formation of species and forms in *Eucalyptus*'.]** *Bot. Ž.* 40 (5), 1955 (748–51). [Russ.]

Scathing criticism of Pilipenko's conclusions [see *For. Abstr.* 16 (No. 3811)], which betray apparent ignorance of the Australian climate, the natural polymorphism of Eucalypts in Australia—due in part to hybridization there, the hybridity of much of the seed imported into the U.S.S.R., and the opportunities for further hybridization there. In addition, the variants observed by Pilipenko were, from his own evidence, often *less* well adapted to the climate of the Black Sea coast.

2481. PAULEY, S. S. **Natural hybridization of the Aspens [: *Populus tremuloides* and *P. grandidentata*.]** *Minn. For. Note* No. 47, 1956. pp. 2.

2482. TRONCO, G. **Il pioppo—questo sconosciuto. [Poplar—the unknown.]** *Ital. agric.* 93 (1), 1956 (63–86). [It.] E.M.B.

A general account of Poplar breeding, silviculture, and utilization, in Italy. 'White' Canadian Poplar hybrids, particularly Clone 488, are recommended for moist, fertile soils new to Poplar growing, and

Black Poplar hybrids (Clones 154 and 214) for less fertile soils.

2483. WENT, J. C. Verslag van de onderzoekingen over de iepenziekte en andere boomziekten, uitgevoerd op het phytopathologisch laboratorium 'Willie Commelin Scholten' te Baarn gedurende 1952 en 1953. **[Report on investigations on Elm disease and other diseases at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, 1952–53.]** *Meded. Com. Ziekt. Boomsoorten* No. 48, 1955. pp. 12. [Du.e.]

Results for the two years include the following: (1) The highest % of hybrid plants resistant to Dutch Elm disease was obtained from *U. carpinifolia* 62 (Bea Schwarz) as parent. All offspring of *U. hollandica* were susceptible. Fifteen of the strains and hybrids that proved most resistant when inoculated with the fungus are listed. (2) Differences in seedling growth appeared among groups of hybrids. Seedlings from *U. glabra* 49, a fast-growing tree, as ♂ parent, were short, with distinctive leaf and shoot types. Most of those from *U. pumila* or *U. pumila pinnata* as ♀ parent had *pumila* characteristics. Those from a cross between *U. laciniata nikkoensis* × *U. wallichiana* and *U. glabra fastigiata* × *U. wallichiana* had wide, coarse leaves and grew rapidly. (3) Of cuttings from *U. carpinifolia* 62, treated with indolylbutyric acid either as a powder or in solution, 70–85% rooted.

2484. SAITO, Y., and HASHIZUME, H. **[The effect of high temperature on the development of abnormal pollen grains in the polyploid tree of *Cryptomeria japonica* D. Don.]** *Transactions of the Tottori Society of Agricultural Science, Tottori, Japan* 10 (3), 1954 (136–144). 21 refs. [Jap.e.] C.G.B.

Male conelets of (*a*) one tetraploid and (*b*) 2 diploid trees were encased in transparent envelopes and exposed to temperatures of 30–45° C. in sunshine. The % of abnormal pollen grains after treatment in (*a*) varied from 11 to 95 as against 2·5 in controls, and in (*b*) 19–53 (1·26 in controls). The majority were incomplete—mostly abortive, a few misshapen, jointed, etc.—and there was an average of 1% giant pollen, i.e. > 50 μ in (*a*) (average 37·7) and > 40 μ in (*b*) (average 33·7). [The tables and graph, but not the photomicrographs, have English titles and legends.]

2485. VABRE-DURRIEU, A. L'hybride *Tsugo-Picea hookeriana* et ses parents: étude chromosomique et caryologique. **[The hybrid *Tsugo-Picea hookeriana* and its parents: a cytological and caryological study.]** *Trav. Lab. for. Toulouse* 1 (5) Art. 17, 1954. pp. 4 + 1 dgm. 6 refs. [F.]

[Cf. *For. Abstr.* 16 (No. 121).] The chromosome number of the supposed hybrid was found to be $2n = 24$.

2486. BOUHARMONT, J. Recherches sur les parasoliers congolais (*Musanga cecropioides* R. Br. et *Cecropia leucocoma* Miq.) II. Étude comparative des chromosomes somatiques. **[Studies on the Umbrella Trees of the Congo (*M. smithii* and *C. leucocoma*). II. A comparative study of somatic chromosomes.]** *Cellule, Louvain* 16 (3), 1954 (251–62 + 1 plate). 1 ref. [F.f.] L.S.

Reports on an investigation carried out at the Institut Carnoy on seeds of *M. smithii* collected at Yangambi, and of *C. leucocoma* from a plantation in Eala, and comments on the great resemblance of chromosome characteristics in species of such differing natural distributions.

2487. HEJNOWICZ, Z. O pierwszej chimerze peryklinalnej wśród nagonasiennych. **[The first periclinal chimaera among gymnosperms.]** *Acta Soc. Bot. Polon.* 25 (1), 1956 (181–202). 28 refs. [Pol.e.] O.B.D.

Anatomical studies on shoots of *Juniperus sabina* var. *variegata* support the hypothesis that this is a periclinal chimaera.

168. Histology

See Nos. 2452, 2457–60, 2501, 3187 *et seq.*, 3244.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 2731, 2954 *et seq.*, 3383 *et seq.*

2488. LANCASTER, M. E. **Forest fungi.** R. E. Owen, Government Printer, Wellington. 1955. pp. 96. 10 refs. [New Zealand Forest Service.]

Descriptions and drawings of forest fungi, in particular those found in New Zealand.

2489. REID, D. A. **New or interesting records of Australasian Basidiomycetes.** *Kew Bull.* 1955 (4), 1956 (631–48). 21 refs.

Based mainly on Australian and New Guinea collections sent for naming at Kew by the Forest Products Division, South Melbourne. Includes, among other records, *Aleurodiscus limonisporus, Odontia lyndoniae*, and *Secotium gloriosum* spp. nov., and *Beenakia dacostae* gen. et sp. nov. Most of the species listed are from fallen trees, stumps etc.

2490. TIFFANY, L. H. **The development of ascocarps of *Endoconidiophora fagacearum*.** *Abstr.* in *Phytopathology* 46 (1), 1956 (29).

2491. WILSON, C. L. **Development of the perithecium of *Endoconidiophora fagacearum*.** *Abstr.* in *Phytopathology* 46 (1), 1956 (31).

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

2492. **Stabilization of important tree nomenclature.** *J. For.* 54 (1), 1956 (62).

A Committee on Tree Names, set up by the Society of American Foresters, has now reported, and recommends to the Society that it should endorse the principle of revising the priority rule so as to prevent changes due to the discovery of an obscure name not used for 100 years (or some shorter period). Alternatively they urge the desirability of lists of *nomina specifica conservanda* or *nomina specifica rejicienda*. The Committee recommends that by one or more of these methods, use of the names *Pseudotsuga taxifolia, Sequoia gigantea* and *Betula lutea* be legitimized. They also recommend

agreement to accept *Populus balsamifera* (vice *P. tacamahaca*) for Balsam Poplar, and *Quercus rubra* (vice *Q. borealis*) for Northern Red Oak. The Council of the Society has unanimously accepted the report.

2493. TUCOVIĆ, A. Prilog poznavanju dendroflore Beograda i okoline. [**Contribution to the knowledge of the tree flora of Belgrade and environs.**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (243–52). 7 refs. [Croat.g.]

Describes 46 native and introduced species or varieties, with notes on location, age and dimensions.

2494. SMITINAND, T. **Some noteworthy plants from Thailand.** *Thai For. Bull.* (*Bot*) No. 2, 1955. pp. 35 + 8 photos. [E.]

The 69 species include a number of smaller trees, shrubs and climbers. There are indexes to botanical and native names.

2495. BROWNE, F. G. **Forest trees of Sarawak and Brunei and their products.** Government Printing Office, Kuching, Sarawak. 1955. pp. 369 + xviii + 47 plates. 4 pp. of refs. Price $12·00.

The introduction has chapters on: the territory and its forests; different kinds of tree, with a key to the principal species; and different types of wood, with a key to those in common use. The main part of the work consists of descriptions of the trees and their timbers, arranged by families, giving distribution, silvicultural characters, products, etc. It is based on the leaflets already published [see *For. Abstr.* 16 (No. 2112) etc.].

2496. PICKEL, D. B. J. As principais árvores que dão madeira. [**The principal [Brazilian] timber trees.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (56–86). [Port.e.]

Notes, with illustrations, on *Niopa macrocarpa, Centrolobium robustum, Schinus terebinthifolius, Machaerium lanatum, Moquinia polymorpha, Adenostephanus incana, Rhopala martii, Esenbeckia leiocarpa, Zeyhera tuberculosa, Machaerium villosum, Guarea guarea, Holocalyx glaziowii, Caesalpinia leiostachya, Piptadenia communis* and *Colubrina rufa*. [Cf. *For. Abstr.* 14 (No. 3087).]

2497. REITZ, P. R. Árvores de Santa Catarina. [**Trees of Santa Catarina.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (122–47). [Port.e.]

Short descriptions of 66 species.

2498. LITTLE, E. L., JR. **Trees of Mona Island.** *Carib. For.* 16 (1/2), 1955 (36–53). 9 refs.

Notes on topography, climate, fauna, history of the island and a brief survey of the vegetation and its range elsewhere, with an annotated list of 100 species of trees and large shrubs.

174.2/.7. Gymnosperms

See also Nos. 2470–2, 2485, 2487, 3190–1.

2499. GAUSSEN, H. Les gymnospermes actuelles et fossiles. [**Extant and fossil gymnosperms.**] **Fasc. V. Coniferales Pt. 1: Pinoïdines [reproductive organs and seed; phyletic conclusions.]** *Trav. Lab. for. Toulouse* 2, I (5), 1955. pp. 96 + 32. [F.]

[Cf. *For. Abstr.* 14 (No. 120).] Includes addenda, errata, indexes and tables of contents for the whole work.

2500. LAING, E. V. **The genus *Abies* and recognition of species.** *Scot. For.* 10 (1), 1956 (20–5 + 7 photos).

2501. VIDAKOVIĆ, M. Značenje anatomske građe iglica kod svojta crnog bora u Jugoslaviji. [**Importance of the anatomical structure of needles in [distinguishing] *Pinus nigra* subspecies in Jugoslavia.**] *Šum. List* 79 (7/8), 1955 (244–53). 21 refs. [Croat.e.]

[Cf. *For. Abstr.* 16 (No. 1462).] The needle structure (in cross-section) is claimed to provide characteristic features of different *Pinus nigra* subspecies and varieties. The author succeeded in differentiating (1) subsp. *pallasiana*, (2) subsp. *gočensis*, (3) subsp. *gočensis* var. *illyrica*, (4) subsp. *dalmatica*, and (5) subsp. *austriaca*. The altitude limits of these subspecies are respectively: 250–1200, 950–1100, 800–1450, 300–620 and 550–900 m.

2502. REY, P. Le pin laricio de Salzmann en Andorre. [***Pinus nigra* var. *cebennensis* in Andorra.**] *Trav. Lab. for. Toulouse* 1 (5) Art. 18, 1954. pp. 4. 5 refs. [F.]

2503. KOBENDZA, R. O sośnie krezowatej albo kołnierzykowej i o sośnie f. *plana* (Christ). [***Pinus sylvestris* var. *annulata*, and *P. sylvestris* f. *plana*.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (253–60). [Pol. russ.e.]

Lists a number of new habitats of *P. sylvestris* var. *annulata* in Poland and describes its habit in detail. All trees of this variety have cones of the form *plana*.

175.2. Monocotyledons

2504. PARDY, A. A. **Notes on indigenous trees and shrubs in Southern Rhodesia.** *Reprs.* from *Rhod. agric. J.* 52 (4), 1955. Each pp [1] + plates. (*Bull. Minist. Agric. Lds. S. Rhod.* Nos. 1832–5).

Hyphaene critica and *H. ventricosa*; *Phoenix reclinata*; *Raphia ruffia*; and *Borassus aethiopium*.

2505. SWALLEN, J. R., and MCCLURE, F. A. **Flora of Guatemala. Part II: Grasses of Guatemala.** *Fieldiana* (*Bot.*) 24 (2), 1955. pp. 390.

Includes Bamboos. [Cf. *For. Abstr.* 14 (No. 1008).]

176.1. Dicotyledons

See also Nos. 2479–81, 3192–9, 3210.

2506. VERDCOURT, B. **Notes from the East African Herbarium: III.** *Kew Bull.* 1955 (4), 1956 (595–609). Many refs.

Includes, among miscellaneous notes, longer notes on *Uvariodendron* (including *U. anisatum* Verdcourt sp. nov.), *Bersama* (several species reduced to subordinate ranks under *B. abyssinica*), *Chytranthus* and *Adinandra* (*A. greenwayi* and *A. intermedia* reduced to varieties of *A. schliebeni*).

2507. PELLEGRIN, F. **Plantae Letestuanae novae. XXXI.** *Bull. Soc. bot. France* 102 (7/8), 1955 (328–31). [F.] O.B.D.

Includes descriptions of two new tree species from Gabon, *Deinbollia rambaensis* and *Mannia le-testui*.

2508. TISSERANT, C. Les *Homalium* de l'Oubangi-Chari (Samydacées). [**The *Homalium* spp. of Ubangi-Shari.**] *Bull. Soc. bot. France* 102 (7/8), 1955 (345–7). [F.] O.B.D.

A morphological study with a description of a new tree species, *Homalium oubanguiense*.

2509. MIRANDA, F. Dos nuevas especies de árboles del sur de México. [**Two new tree species from the south of Mexico.**] *An. Inst. Biol. Univ. Méx.* 26 (1), 1955 (79–87). [Span.] C.G.B.

Magnolia sharpii, up to 25 m. high, and *Bucida wigginsiana*, up to 15 m. high. Descriptions of the trees and their habitat.

2510. SANDWITH, N. Y. **Contributions to the flora of Tropical America: LX. New species of trees from British Guiana.** *Kew Bull.* 1955 (3), (469–80).

Cathedra guianensis, Tapirira fanshawei, Gustavia gigantophylla, Couratari gloriosa, C. riparia, Eschweilera eperuetorum, E. potaroensis, E. fanshawei, spp. nov., and two new combinations—*E. praealta* and *E. grandiflora*, transferred from *Lecythis*.

2511. SANDWITH, N. Y. **Contributions to the flora of Tropical America: LIX. Two new species from British Guiana.** *Kew Bull.* 1955 (3), (371–6).

Rinorea neglecta and *Porocystis demerarae*. Includes also a simple key to the British Guiana species of *Rinorea*.

2512. BROWICZ, K. Klony japońskie w Polsce. [**Japanese species of *Acer* in Poland.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (377–99). 12 refs. [Pol.russ.e.]

Lists, with leaf drawings and notes on location and dimensions, 13 species and 24 varieties and forms of Japanese *Acer* found in parks and arboreta of Poland.

2513. GAJIĆ, M. Revizija dijagnoza nekih formi klena (*Acer campestre*). [**Revised diagnoses of some forms of *A. compestre*.**] *Glasn. šum. Fak., Beograd* No. 8, 1954 (285–8). 6 refs. [Serb.g.]

Introduces corrections into diagnoses of *A. campestre* var. *varbossianum* and *A. campestre* var. *varbossianum* f. *sendtneriana*.

2514. SHERFF, E. E. **Revision of the Hawaiian members of the genus *Tetraplasandra* A. Gray.** *Fieldiana* (*Bot.*) 29 (2), 1955 (49–142).

2515. SENETA, W. Azjatyckie gatunki *Juglans* z sekcji *Cardyocaryon* Dode. [**Asiatic species of *Juglans*, section *Cardyocaryon*.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (405–13). 7 refs. [Pol.russ.e.]

A review of taxonomic papers.

2516. BROWICZ, K. Korkowiec amurski (*Phellodendron amurense* Rupr.) i jego znaczenie gospodarcze. [***P. amurense* and its economic importance.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (305–23). 20 refs. [Pol.russ.e.]

A review (11 of the references are Russian).

2517. BUGAŁA, W. Topole krajowe i obce, ich znaczenie gospodarcze. [**Indigenous and foreign Poplars [in Poland], and their economic significance.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (415–72). 58 refs. [Pol.russ.e.]

Indigenous are: *Populus tremula*, *P. alba*, and *P. nigra*; quite widespread also are hybrids of *P. alba* with *P. tremula* or with *P. canescens*. Special attention is given to 'Grey Poplar', *P. canescens*, which the author considers to be the collective name for numerous hybrids arising from natural crosses between *P. alba* and *P. tremula*, or between these crosses and either of the parent spp. The Euroamerican Black Poplar hybrids are classed, following Guinier, under the name *P. euroamericana*. Other forms and hybrids are also described.

2518. KOBENDZA, R. Okazy żeńskie topoli piramidalnej w Polsce. [**Female specimens of *Populus nigra* var. *italica* in Poland.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (191–207). 19 refs. [Pol.russ.e.]

Describes specimens found in Warsaw and environs. They are of two types: (1) with a narrow pyramidal crown reaching the base of the stem, and (2) with a much broader, more open crown which begins at a certain height above ground level. The latter might be of hybrid origin.

2519. MOLDENKE, H. N. **Materials towards a monograph of the genus *Vitex*. II, III.** *Phytologia* 5 (6; 7), 1955 (186–224; 257–80). A.P.B.

Cf. *For. Abstr.* 17 (No. 1297).

18. Plant Ecology

See also No. 2368.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 2495, 2631, 2677, 2688.

2520. MCCOMB, A. L. **The European Larch: its races, site requirements and characteristics.** *For. Sci.* 1 (4), 1955 (298–318). 56 refs.

Summarizes information in recent European literature, with additional data on the climate and soils of areas of Larch culture in eastern Austria and a review of American experience with the species.

2521. TUMIŁOWICZ, J. Modrzew polski (*Larix polonica* Rac.) w powiecie grójeckim. [***L. polonica* in the district of Grójec.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (209–22). 12 refs. [Pol.russ.e.]

Describes two of the best preserved natural habitats of *L. polonica*, forming mixed stands with Oak and other broadleaved species, up to 200 years old, and averaging 34 m. in height. Conditions for Larch natural regeneration are unfavourable owing to a dense shrub and herbaceous growth.

2522. JAHN, G. Standörtliche Grundlagen für den Anbau der grünen Douglasie, unter besonderer Berücksichtigung des nordwestdeutschen Mittelgebirges. [**Site conditions for the planting of *Pseudotsuga taxifolia* var. *viridis*, with special**

reference to the north-west German mountain region.] *SchrReihe forstl. Fak. Univ. Göttingen* No. 11, 1954. pp. 112. 89 refs. [G.g.]

After analysing, chiefly on the basis of American literature, the influence of climatic factors and site conditions on the green Douglas Fir in its natural habitat, the author describes in some detail all stands worth considering, aged 30 years or more, in the north-west German mountains from the Eifel to the Harz. For nearly 100 stands totalling ca. 20 ha., the oldest ca. 80 years, data are given on climate, altitude, physical and chemical soil characteristics, water regime, topography and characteristic plant associations on the one hand, and yield and height growth on the other (some by extrapolation), and the latter are compared with the performance of Spruce on similar sites. Douglas tends to be progressively superior the better the site, and its superiority is greater in pure stands than in mixtures. The paper also deals with Douglas Fir silviculture—spacing, tending, thinning, pruning etc.—its resistance to frost, wind, drought, pests and diseases, and its influence on the health of the site. In this connexion its rooting habits on various types of soil, and in particular its penetration of the soil space between the trees, were investigated. The main root zone was in most cases the A_3 and B horizons, averaging 40–55 cm. in depth. In mixtures with Spruce, Douglas roots formed a layer underneath those of Spruce. Recommendations for the future use and silvicultural treatment of Douglas include its use on fresh sites in the lower parts of the *Fageto-Piceetum*, on certain sites where conifers have difficulty in competing with hardwoods, in conversions of coppice etc., and the afforestation of dry shallow sites, but in view of the danger of needle-cast diseases, mixtures are generally to be preferred to pure stands.

2523. MARIE-VICTORIN, [FRÈRE], and LEON, [FRÈRE]. Itinéraires botaniques dans l'Île de Cuba. (Troisième série). [**Botanical excursions in the island of Cuba (3rd series).**] *Contr. Inst. bot. Univ. Montréal* No. 68, 1956. pp. 227.

Includes a chapter on the stands of *Pinus cubensis*, an endemic Cuban species. [Cf. *For. Abstr* 6 (p. 224).]

2524. **Alder assumes importance and is discussed by foresters at 34th Washington State Conference.** *Lumberm.* 82 (13), 1955 (87).

Summarizes very briefly papers and discussion on uses of Red Alder [*Alnus rubra*] for pulping, timber and panelling, its seasoning, logging methods, natural regeneration, increment, epicormic branches and their effect on quality, soil relations and rotation.

2525. FRANKLIN, T. O cumaru das caatingas, *Amburana cearensis* (Fr. All.). A. C. Smith. [***A. cearensis.***] *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (216–25). [Port.e.]

Notes on taxonomy, range, nomenclature, silvicultural requirements, seed production, seed germination and wood properties.

2526. FILHO, A. F. COIMBRA, and FILHO, A. DE MATTOS. Ensaios e apontamentos sôbre a urucurana. [**Tests and observations on *Hieronyma alchorneoides.***] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (188–95). 6 refs. [Port.e.]

Presents information on the range, morphology, wood anatomy and properties, growth and development of the tree.

2527. LAMPRECHT, H. Camoruco. [***Sterculia apetala.***] *Bol. Ingen. for. Univ. Los Andes* 2 (9), 1955 ([127] + 1 photo). [Span.]

Notes on the tree, its distribution in Venezuela and its silvicultural requirements.

2528. LAMPRECHT, H. Apamate. [***Tabebuia pentaphylla.***] *Bol. Ingen. for. Univ. Los Andes* 3 (10), 1956 ([i], 81). 1 ref. [Span.]

Notes on its range in Venezuela, silviculture, characteristics and uses of the wood.

181.1. Distribution, Natural Range

See also Nos. 2471, 2617.

2529. PASSARGE, H. Grundlagen und Aufgaben einer forstlich angewandten Arealkunde. [**Basis and tasks for an applied chorology in forestry.**] *Arch. Forstw.* 3 (7/8), 1954 (694–705). 10 refs. [G.g.]

Having established the outer limits of the natural range of a timber species, forest chorology ascertains the interior limits (maxima and minima) of its occurrence. The object of applied chorology (phytogeographical subdivision of the range or clarification of the autecology) can only be attained by floristic mapping on a site basis. For a criterion of site, a better approach is through the plant association. These premises are illustrated, using about 400 quadrats of a previous study [see *For. Abstr.* 15 (No. 2362); 16 (Nos. 286–8)], by distribution maps of (*a*) *Tilia cordata*, (*b*) *Ulmus carpinifolia*, (*c*) *Acer campestris*, and (*d*) *Acer pseudoplatanus*, showing their occurrence in the central German dry zone according to forest association and their proportion in the tree population (for (*a*) and (*b*) above and below 25%, for (*c*) and (*d*) above and below 5%). The probability is suggested that (*a*) and (*b*) have a climate-conditioned centre of distribution in the loess hill land (Halle-Ascherleben) where both species are relatively indifferent as to site. Their occurrence fades away to the west, north and east with a closer restriction to edaphic sites. In contrast the occurrences of (*c*) and (*d*) appear to be mere rays from a subatlantic-submediterranean centre. They are limited here, unlike their occurrence in south and west Germany, to special sites.

2530. SCAMONI, A. Teeröfen als Nachweis eines ursprünglichen Vorkommens der Kiefer. [**Tar kilns as indicators of a former occurrence of *Pinus sylvestris.***] *Arch. Forstw.* 4 (2/3), 1955 (170–83). 41 refs. [G.]

The tar-kiln localities of the period 1780–1830 are shown on a map of the North German diluvium region [Mecklenburg, Brandenburg, Saxony, between the Elbe and Oder] and numbered for reference to a gazeteer arranged by forest regions.

The culmination of the local tar industry was in the latter half of the 18th century and Pine first began to be planted there in 1700. The average requirement in mature timber was probably about 5000 stacked cu.m./year/kiln. The occurrence of these kilns in the Beech, Beech/Oak, Beech/Oak/Pine, Oak/Pine, Oak/Birch and Pine/Oak regions is discussed. It is concluded from this pilot investigation of a new source of evidence that Pine occurred extensively in mixture, but that only locally was there natural Pine forest (*Pinetum*) over a larger area.

2531. Čolić, D. B. Staništa Pančićeve omorike na desnoj strani Drine. **[The stations of *Picea omorika* to the east of the R. Drina.]** *Zaštita Prirode, Beograd* No. 4/5, 1953 (425–659). 53 refs. [Serb.f.g.]

Includes a review of literature, an account of the climatic and soil conditions under which *P. omorika* occurs naturally, and—making up the bulk of the work—descriptive notes on each of the 41 stations in the area, with lists of associated species and their frequency. The French and German summaries include translations of the captions of the many tables, photographs etc.

2532. Kayacik, H. **The distribution of *Picea orientalis* (L.) Carr.** *Kew Bull.* 1955 (3), (481–90). 15 refs.

P. orientalis is indigenous only in the Caucasus and N.E. Anatolia; it does not exist in the south of Asia Minor, nor farther west than the Melet River, and records from other areas are believed to be erroneous. It shows no preference for particular soil types, and ranges from sea level to 1800–2400 m., reaching its optimum development above 1200 m. Its rarity in the lowlands may be more connected with the influence of biotic (human interference, competition) than with climatic and edaphic factors; its general distribution, however, is determined mainly by climatic factors, e.g. deficient rainfall and low atmospheric humidity. Westwards, it is also limited by dense forest of *Fagus orientalis*. The paper includes brief descriptions of the woodland vegetation types of the area, some data on temperature, rainfall and humidity, and a sketch map.

2533. Rasmusson, G. Studier över björkens hojdgränser på fjället Krappesvaare. **[The height limit of Birch [*Betula tortuosa?*] in the Krappesvaare mountains [40 km. south of the Arctic circle].]** *Svensk Geografisk Årbok, Lund* 31, 1955 (73–81). 8 refs. [Sw.g.] A.P.B.

The tree and forest limit vary with aspect; the former is ca. 793 m., the latter is between 700 and 775 m.

2534. Fox, W. S., and Soper, J. H. **The distribution of some trees and shrubs of the Carolinian Zone of Southern Ontario, I, II, III.** *Transactions of the Royal Canadian Institute, Toronto* 29 (2), 1952 (65–84); 30 (1), 1953 (3–32); 30 (2), 1954 (99–129). 69 refs. L.S.

A detailed description, giving distribution maps for 41 species and discussing the conclusions to be drawn from their occurrence in vegetation zones in Southern Ontario. [Cf. *For. Abstr.* 1 (p. 24).]

2535. Oosting, H. J., and Hess, D. W. **Microclimate and a relic stand of *Tsuga canadensis* in the Lower Piedmont of North Carolina.** *Ecology* 37 (1), 1956 (28–39). 22 refs. [Duke University, N.C.]

A study was made of a stand separated from the normal range of the species by 200 miles. It is interpreted as a relic of Pleistocene vegetation, surviving because of the special microhabitat provided on a north-facing bluff where insolation, temperatures and evaporation are lower, and available soil moisture greater, than elsewhere in the region.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 2448, 2531–2, 2535, 2569–71, 2579, 2669 *et seq.*, 2907–12, 3113.

2536. Wassink, E. C., and Wiersma, J. H. **Daylength response of some forest trees.** *Repr.* from *Acta bot. neerland.* 4 (5), 1955 (657–70 + 1 plate). 9 refs.

Greenhouse experiments were carried out on *Liriodendron tulipifera* and *Fagus sylvatica*. Natural daylight was used for the basic illumination period of 10 hours, extended by fluorescent lighting to a day-length of 16 hours when necessary. In both species long-day (16–18 hours') illumination brings about a lengthening of the branches (and especially of the main shoot in *Liriodendron*) and a higher fresh and dry weight. A day-length of 16 hours did not cause continuous growth during winter under the conditions of the experiment, but lengthened the growth period in both species as compared with a day-length of 10 hours. Two provenances of *Pinus sylvestris* (one from Sweden and one from France) were also studied to find possible interactions between effects of racial variety and day-length. Plants of southern provenance grew well both in long days of 24 hours and in short days of 12 hours. Seedlings of southern provenance showed a possible correlation between growth and relative size of the root system, but except in special cases, such correlation was not observed in plants of northern provenance. [Cf. *For. Abstr.* 13 (No. 136).] *From authors' summary.*

2537. Burgers, T. F. El *Eucalyptus viminalis* Labill., especie resistente a las heladas. **[*E. viminalis*, a frost-resistant species.]** *Montes, Madrid* 11 (66), 1955 (415–20). 13 refs. [Span.]

E. viminalis during a cold spell in Feb. 1954 withstood, without damage, temperatures ranging from 26° to 29° F. at Río Tinto (Huelva). Notes, based on literature, are presented on stands of this species and the accompanying climatic factors in Australia, French Morocco, S. Africa, California, Italy and Ecuador.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 2380, 2382, 2385–90, 2396, 2398–400, 2403–4, 2413–6, 2446–8, 2522, 2531, 2562, 2580, 2674, 2755, 2784–6, 2812, 3219–20.

2538. Bunuševac, T. Odnos bradavičaste kurike

(*Evonymus verrucosa* Scop.) prema uslovima zemljišta u Jugoslavii. [**Soil requirements of *E. verrucosus* in Jugoslavia.**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (215–42). 19 refs. [Serb.f.]

2539. BUNUŠEVAC, T. Vezanost bradavičaste kurike (*Evonymus verrucosa* Scop.) za određene tipove šuma i staništa. [**Occurrence of *E. verrucosus* as related to particular forest and site types.**] *Glasn. šum. Fak., Beograd* No. 8, 1954 (221–50). 24 refs. [Serb.serb.g.]

The most favourable conditions for *E. verrucosus* in Jugoslavia exist in stands of density 0·4–0·6, on moderately dry to fresh soils rich in $CaCO_3$ and humus, within the communities *Querceto-carpinetum* (relatively dry), *Querceto-carpinetum serbicum aculeatetosum*, and *Quercetum confertae-cerris aculeatetosum*.

2540. RENNIE, P. J. **The uptake of nutrients by mature forest growth.** *Plant & Soil* 7 (1), 1955 (49–95). 83 refs. [Department of Forestry, University of Oxford.]

All existing nutrient-composition data for the roots, stemwood, stembark, branches and leaves of individual mature trees of the temperate forest (17 European and 2 North American species) are summarized. From yield data and a method of calculation critically discussed, nutrient-uptake estimates for one acre of such forest, during 50 and 100 years' growth, are derived. Mean estimates representing 'hardwood', 'other conifers' and 'Pine' forest are then calculated showing the Ca, K, and P removed from the site via the stem timber and branches in the intermediate and final fellings; the nutrients immobilized in the various organs of the growing forest; and the total nutrient uptake from the site. These estimates show, in the continuous nutrient drain of exploited forest, its fundamental difference from virgin forest. In absolute terms the drain may be small but its importance depends entirely on the ability of the local soil to replenish the loss. It is believed that hitherto failure to recognize this drain on poor soils has diverted attention from an important cause of soil degradation and diminishing productivity. Moor soil data from Yorkshire, England, are presented to show that both of these processes are sooner or later inevitable because the nutrient uptake of either coniferous or hardwood forest is so large compared with the nutrient contents of these soils. Continuous timber production cannot therefore be sustained there by ploughing or by the growth of hardwoods. New techniques are needed for the restoration to the soil (by suitable ameliorants and methods yet to be evolved) of the nutrients continually removed.

2541. LEYTON, L. **The relationship between the growth and mineral composition of the foliage of Japanese Larch (*Larix leptolepis*, Murr.).** *Plant & Soil* 7 (2), 1956 (167–77). 17 refs. [Department of Forestry, Oxford University.]

[Cf. *For. Abstr.* 17 (No. 1332).] Sampling from a lateral branch of the terminal whorl of 26 six-year-old Japanese Larches, ranging from 65 to 351 cm. high, and growing on a heterogeneous heathland podzol, gave significant linear correlations between the height of the trees and the concentrations of N, P, K and ash in the needles. Analysis of the multiple regressions suggests that only the contributions of N and K are significant, and an estimate of a tree height (cm.) with a standard error of $\pm$ 40·9 cm. and with a highly significant multiple correlation coefficient of 0·916 is provided by the function $123{\cdot}27\,N + 188{\cdot}69\,K - 180{\cdot}91$ where N and K are the % dry-weight concentrations of these substances in the needles. It is argued, therefore, that on this site, and under the range of concentrations encountered, deficiencies of N and K limit height growth. A current experiment, not yet evaluated statistically, definitely indicates a response to both nutrients.

2542. FEHÉR, D. Az akáckérdés. [**The Robinia problem.**] *Erdö* 4 (3), 1955 (83–91). [Hu.]

The importance of favourable environmental conditions (soil composition, moisture economy, biological activity) for Robinia is stressed. Tabulated data from Hungary and elsewhere in Europe are presented on the total K and P uptake and minimum requirements of Robinia according to age (20–40 years) for various site classes, both being relatively high in comparison with *Pinus* and several hardwood species. Comparative figures, including the Hungarian Alföld and subalpine zone, are also presented in support of the suggestion that the nutrient reserves in forest soils tend to decrease from northern to southern latitudes.

2543. HELLINGA, G. Banjaknja zat² abu mineral jang diambil dari tanah oleh tegakan² djati (*Tectona grandis*) dan djeundjing (*Albizzia falcata*). [**The amounts of mineral constituents taken up from the soil by stands of *T. grandis* and *A. falcata*.**] *Rimba Indonesia* 4 (9/12), 1955 (367–77). 8 refs. [Jav.Du.e.]

Data, drawn from Indonesian literature, are given for ash content of the woods of these two and 31 other species. Leaf analyses are also needed to determine the chemical demands of these species on the soil.

2544. PRYOR, L. D. **Ectotrophic mycorrhizai n renantherous species of *Eucalyptus*.** *Nature, Lond.* 177 (4508), 1956 (587–8). 6 refs. [Parks and Gardens Section, Department of the Interior, Canberra.]

The group *Renantherae* have been found, on genetic grounds, to be a very distinct natural unit within the genus *Eucalyptus*, and species of this group, which includes many valuable timber species, have been partial or total failures when tried in the northern hemisphere. In order to test the theory that lack of mycorrhiza might be responsible for this failure, pot cultures of 3 species of *Renantherae* (*E. dives*, *E. pauciflora*, and *E. macrorrhyncha*) and one of *Macrantherae* (*E. bicostata*) were grown (*a*) in soil inoculated with *Scleroderma flavidum* and (*b*) in sterilized soil. After 4 months there were distinct differences between the two sets of cultures of the *Renantherae*, (*a*) being respectively 5·3, 6·2, and 11·3 in. high, of normal colour and with abundant mycorrhizae, while (*b*) measured only 3·3, 3·3, and 7·8 in., were yellowish in colour, and had no

mycorrhizae. On the other hand, there was no significant difference in height or colour between (*a*) and (*b*) cultures of *E. bicostata*, which displayed no mycorrhizae. The experiment suggests that the failure or indifferent growth of many species of the *Renantherae* in the northern hemisphere might be corrected by inoculation with the appropriate fungus. There are reasons for thinking that the situation may differ in the southern hemisphere, and records exist of satisfactory growth of renantherous species in both New Zealand and South Africa. It may well be that there is a degree of affinity in the fungal flora of these countries and Australia, which leads to the presence of adequate mycorrhiza-forming fungi.

2545. LEVISOHN, I. **Growth stimulation of forest tree seedlings by the activity of free-living mycorrhizal mycelia.** *Forestry* 29 (1), 1956 (53–9 + 2 plates). 11 refs.

Observations by M. C. Rayner on a field experiment and the results of subsequent pot culture experiments demonstrate that the soil activity of mycorrhizal fungi can improve the development of forest tree seedlings (*Picea*, *Pinus*, *Betula*) before actual mycorrhizal infection takes place. Further experiments show that ectotrophic mycelia are capable of stimulating endotrophic tree species (*Fraxinus excelsior*, *Chamaecyparis lawsoniana*, *Robinia pseudoacacia*), i.e. that these ectotrophic mycorrhiza-formers bring about growth stimulation of the plant although no infection is formed at a later stage. It is suggested provisionally that at least some ectotrophic mycelia, *Boletus scaber* and *Rhizopogon luteolus*, may influence seedling growth by attacking soil organic matter and liberating 'nutrients' from which the higher plant benefits. [Cf. *For. Abstr.* 16 (Nos. 220, 225); 17 (No. 226).] *Author's summary.*

2546. HARLEY, J. L. **The mycorrhiza of forest trees.** *Endeavour* 15 (57), 1956 (43–8). 12 refs.

The author reviews and discusses recent experimental research on mycorrhiza, with particular reference to work on excised mycorrhizal roots of Beech. The general conclusion is drawn that these 'mycorrhizal roots are highly efficient aerobic accumulators of ions, so that in times of litter breakdown they successfully compete for plant nutrients with other living organisms of the humus zones of forest soils. The material so accumulated may become available to both host and fungus by a gradual but metabolically dependent process of redistribution'.

2547. HARLEY, J. L., and WAID, J. S. **The effect of light on the roots of Beech and its surface population.** *Plant & Soil* 7 (1), 1955 (96–112). 21 refs. [Department of Botany, University of Oxford.]

The effects here given of different reductions in daylight (25, 14, 11, 6 and 4%) on the growth and nature of mycorrhizae in Beech seedlings are very similar to those reported by other workers on forest trees. Root-surface populations were studied in culture on 2-mm. segments of the tap-root and lateral roots, 100 of each, for each light level. Tables show the % occurrence of 21 fungi. The general condition of the host plant is shown to be a major factor in determining the composition of these populations, but uncertainty still obtains on the influence of micro-fungal interaction (discussed for *Rhizoctonia* and *Trichoderma*) on this composition. Infections were not seen until the first two true leaves were spread. Shading eventually leads to an increase of parasitic infection, increased light to greater mycorrhizal infection. Shading of a succession of Beech crops is likely to build up the semi-pathogen population of the nursery soil. Seedlings raised on such soil were inferior at 2½ years to those raised on a Beech forest soil.

2548. DOMINIK, T., NESPIAK, A., and PACHLEWSKI, R. Badanie mykotrofizmu roślinności zespolów na skálkach wapiennych w Tatrach. [**Mycotrophy of plant associations of calcareous rocks in the Tatra range.**] *Acta Soc. Bot. Polon.* 23 (3), 1954 (471–85). 9 refs. [Pol.g.] O.B.D.

Deals mainly with non-woody associations, but also with *Piceetum excelsae normale*.

2549. DOMINIK, T., and PACHLEWSKI, R. Badanie mykotrofizmu zespołów sosnowych w Łebie nad Bałtykiem. [**Studies on mycotrophy in Scots Pine stands at Łeba on the Baltic.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (53–96). 8 refs. [Pol.pol.russ.g.]

Results of observations in Pine stands on (1) partly shifting sand dunes, (2) stable dunes, and (3) peat-moors, near the Łeba estuary. The following Pine communities were studied: *Pinetum empetrosum*, *P. callunosum*, *P. cladoniosum*, *P. vacciniosum*, *P. myrtillosum*, *P. muscosum*, *P. molinietum*, and *P. sphagnosum*. It was found that the proportion of mycotrophic species was more than twice as great for (2) as for (1); plants that were autotrophic in sparse communities on (1), showed mycotrophism when in dense, older communities on (2); Scots Pine forms different mycorrhizae in different communities; *Quercus* and *Betula*, besides the typical ectotrophic mycorrhizae, form small amounts of endotrophic tolypophagous mycorrhizae; the best, and coralloid, development of mycorrhizae in Pine occurred most frequently between the scales of the old bark of the root collar, there being fewer in the litter and fewer still in the mineral soil.

2550. DOMINIK, T., and PACHLEWSKI, R. Badanie mykotrofizmu zespołów roślinnych regla dolnego w Tatrach. [**Mycotrophy of plant associations of the lower forest zones of the Tatra range.**] *Acta Soc. Bot. Polon.* 25 (1), 1956 (3–26). 14 refs. [Pol.g.] O.B.D.

[Cf. *For. Abstr.* 16 (No. 2759).] The following associations were investigated: *Fagetum typicum*, *Fageto-Abietetum*, *Cratoneuron falcatum*/*Cardamine opizii* and *Piceo-Abietetum* (Silver Fir and Norway Spruce arising out of *Fagetum typicum* after removal of all the Beech). Results are tabulated. The Beech associations showed ca. 70% of mycotrophic infection, a lower % than the Spruce associations of the upper zone of the same range, possibly owing to decreased illuminations at the lower levels. Many species showed a difference in mycotrophy according to level. At higher levels more tolypophagous types of endotrophic mycorrhizae were

found; at the lower, thamniscophagous types predominated. A new classification of ectotrophic mycorrhizae by Dominik was tentatively used in a study of Spruce mycorrhizae and compared with an analysis of Spruce mycorrhizae in the Riesengebirge. From the whole study in the Tatra range the following conclusions are drawn: (1) The degree of mycotrophy of a stand cannot be assessed by the number of fructifications. (2) Obligate mycotrophic species are always highly mycotrophic, even in swampy soils, so long as running water is present, e.g. *Ranunculus* spp., *Abies alba*, *Acer pseudoplatanus*, *Adenostyles alliariae*, *Astrantia major*, *Digitalis ambigua*, *Paris quadrifolia*. (3) *Cenococcum graniforme* is found in abundance in all soils at all altitudes, but only forms mycorrhizal associations under certain conditions, viz. in poor soils, on barren land etc. (4) *C. graniforme* can also form ectotrophic associations with herbaceous plants. (5) Species of *Rhizophagus* are universally present in the Tatra range.

2551. QUISPEL, A. **Symbiotic nitrogen fixation in non-leguminous plants. III. Experiments on the growth *in vitro* of the endophyte of *Alnus glutinosa*.** *Acta bot. neerland.* 4 (5), 1955 (671–89). 5 refs. O.B.D.

[Cf. *For. Abstr.* 16 (No. 2764).] Describes a method that makes it possible to determine, in a semi-quantitative way, the amount of an endophyte in a suspension of root nodules or in an inoculated solution. The method was used for the study of the development of the endophyte in several nutrient solutions. The usual nutrient solutions do not permit any development of the endophyte, nor is this promoted by adding the well-known growth substances, amino-acids and nucleic-acid components. Most soil and peat suspensions do not permit the development of the endophyte, but in some peat suspensions a definite development was measured, the difference being caused by the presence of growth-inhibiting substances in the unusable peat suspensions. Alcoholic extracts of the usable peat, prepared after a previous water extraction, contain a growth-promoting factor that enables the endophyte to grow on the usual nutrient solution. The endophyte does not grow in suspensions of Alder roots. Alcoholic extracts of N-poor Alder roots, prepared after a thorough water extraction, sometimes contain the growth-promoting substances, while other extracts contain growth-inhibiting substances. *From author's summary.*

2552. BAÑADOS, L. L., and FERNANDEZ, W. L. **Nodulation among the Leguminosae.** *Philippine Agriculturist, Laguna* 37 (9), 1954 (529–33). H.S.B.

Of the examined species of Caesalpinioidae only *Cassia mimosoides*, *C. occidentalis* and *Hymenaea courbaril* showed nodulation. In the subfamily Mimosoideae the % of nodulation ranged from 60 to 100. Three species did not have nodules, viz. *Parkia javanica*, *Calliandra inaequilatera* and *Adenanthera intermedia*. All the examined species of Papilionatae showed a high % of nodulation, except *Gliricidia sepium*. The highest % of nodulation occurred among the climbers and herbaceous plants. *From authors' summary.*

2553. BOND, G. **A feature of the root nodules of *Casuarina*.** *Nature, Lond.* 177 (4500), 1956 (191–2). 5 refs. [Dept. of Botany, Glasgow University.]

Considerable numbers of nodulated plants of *Casuarina cunninghamiana* and *C. equisetifolia* were grown in water culture and the nodule roots showed strong upward growth. In some cases the roots, which bear few or no root-hairs, attained a length of 10 cm. and projected from the surface of the culture solution. Similar features have been recorded previously for *Myrica gale* growing under a variety of cultural conditions and in the field [cf. *For. Abstr.* 14 (No. 168)]. In that species, the upward growth of the nodule roots was shown to be the result of negative geotropism, and was thought to be possibly of significance in the ventilation of nodules, which are otherwise enclosed in a layer of cork tissue. The general position seems to be much the same in *Casuarina*.

2554. WENDELKEN, W. J. **Root development and wind-firmness [of *Pinus radiata*] on the shallow gravel soils of the Canterbury Plains.** *N.Z. J. For.* 7 (2), 1955 (71–6).

Strong winds and shallow soils are the critical factors in the development of forests on these gravel plains. Studies of root systems in trees at Eyrewell Forest show that all roots are superficial and that, under orthodox silvicultural systems, no degree of stand stability is likely to be achieved. Interlocking of root systems through development of a group structure in the stands does, however, offer some promise of greater wind-firmness. *From author's summary.*

2555. HEIKURAINEN, L. Rämemännikön juuriston rakenne ja kuivatuksen vaikutus siihen. **[Structure of the root systems of Pine stands on wet peat-moors and the effect of drainage on these systems.]** *Repr.* from *Acta for. fenn.* 65 (3), 1955. pp. 85. 49 refs. [Fi.fi.g.]

An investigation based on 380 soil samples, 10 × 10 × 20 or 25 cm., taken from between trees of stands of various ages and densities on 13 sample plots on *räme* (wet Pine peat-moor; cotton-grass and dwarf-shrub types), some of which had been completely or partly drained. The amount of long roots found was great, their total length often exceeding 1 km./cu.m. of soil. The maximum is reached at an early age. In comparable stands, their amount was greater on drained than on undrained sites. Generally, the greater the m.a.i. of a stand, the greater the root system. Some 85–90% of the roots were in the top 10 cm. of soil, depending on drainage, but even on effectively drained sites few roots penetrated below 20 cm. The relationship between rooting depth and groundwater level was complex. Some 85% of the roots were > 1 mm. in diameter. The amount of thicker roots depended on tree size, that of thin roots chiefly on vigour. Short roots were found only on the thinnest roots, ca. 30 per 10 cm. of long root. Their density decreased with the age of the stand and with drainage. A, B, C, D [Melin-type?] and pseudo-mycorrhizae were found

in all samples. Compared with Pine stands on mineral soil [cf. *For. Abstr.* 14 (No. 169)] the roots in peat are longer, thinner and more superficial, the differences becoming less marked on drained sites. It is suggested that the root competiton disclosed in these investigations points to the desirability of wide spacings; the superficiality of the roots, which is little affected by drainage, to the need for improving the top layers of peat soil (e.g. by Birch admixtures); and the early attainment of maximum root systems, to the advantage of short rotations.

2556. HEIKURAINEN, L. Über Veränderungen in den Wurzelverhältnissen der Kiefernbestände auf Moorböden im Laufe des Jahres. [**Seasonal changes in the root systems of Pine stands on peat-moors.**] *Repr.* from *Acta for. fenn.* 65 (2), 1955. pp. 70. 42 refs. [G.g.fi.]

The investigation, carried out in connexion with work described in the previous abstract, showed such changes to be both considerable and rapid. Long roots started growing in early spring before the resumption of surface growth, and reached their greatest over-all length only in June, to decline again, rapidly at first, in autumn. Total lengths of roots in late summer were only ca. 50 to 70% of those in late spring, the differences being greatest in the thinnest roots. Density of short-root development per cm. of long root followed a different pattern, increasing all through the summer. These changes do not appear to be caused by changes in precipitation or groundwater level, but to be part of a general growth rhythm. *From author's summary.*

2557. KALELA, E. K. Hakkuun vaikutuksesta männikön juurisuhteisiin. [**The effect of felling on the root relations of Pine stands.**] *Metsät. Aikak.* 1955 (12), (405–6). [Fi.e.] (*Metsätietoa, Helsinki* No. 2, 1955.)

Silvicultural thinning reduced the root amount [in terms of metres of root per sq. m. projection into the rhizosphere] in a Pine stand by 15–25% but by the end of the second growing season after thinning the reduction had been made good as between the thinned and unthinned stands. On the other hand, even in the second season after felling there was a reduction of 37% in a stand felled selectively for sawlogs as compared with an untouched stand, and this was only very slowly made up. *From author's summary.*

2558. KERESZTESI, B. Néhány adat az akác gyökérrendszeréről. [**Some data on the root system of *Robinia pseudoacacia*.**] *Erdö* 4 (3), 1955 (113–21). [Hu.]

Observations on root development in soil monoliths taken from various 12- to 23-year-old Robinia stands indicated that the roots, especially of coppice shoots, have only slight penetrating power, tending to avoid and grow along compacted horizons unless they find channels left by decayed old roots. In these, roots of different individuals meet and even coalesce. The intensity of root development was highest in the upper humus layer (0·35 cm.) and in the first humus layer buried under sand (105–128 cm.) close to the stem, but was still considerable in the second buried humus layer (180–200 cm.) at 1·5 m. distance from the stem. Living root systems showed less penetrative power than those of the preceding generation, possibly owing to soil compaction or to reduced vitality. In a mixed stand, the greatest concentration of Robinia roots was found in the same soil layers as the Oak roots and *vice versa*, suggesting that deep-rooting tree species are likely to improve conditions for easier root penetration by Robinia. Determinations of the total root mass in 25- to 27-year-old Robinia stands on different soil types showed an inverse relationship between root activity and fertility levels, the total weight of roots decreasing in the order: sandy prairie soil, sandy brown forest soil and chernozem.

2559. GYURKÓ, P. Néhány adat az akác rizoszférájáról. [**Some data on the rhizosphere of *Robinia pseudoacacia*.**] *Erdö* 4 (3), 1955 (121–8). [Hu.]

Pot experiments using a Cholodny-slide technique, showed extremely high numbers of bacteria (432,800/sq. mm.), forming a kind of sheath round the root-hairs of 4-week-old seedlings. The bacterial population rapidly decreased with distance and fell to the level of that in control soil (ca. 700/sq. mm.) at 2·5–3 mm. from the roots. Actinomycetes were concentrated at 0·5–1 mm. from the roots and fungus numbers increased to reach constant levels at 2·5–3 mm. distance, where spore-forming bacteria also made their appearance. Rhizobia, but no non-symbiotic N-fixing organisms or algae were identified in the rhizosphere. Results indicate that the root-hairs of Robinia exert a specific action on the soil microflora to a distance of ca. 2·5 mm.

2560. BESKARAVAĬNYĬ, M. M. Srastanie korneĭ nekotoryh drevesnyh porod v raïone g. Kamyšina. [**Root-grafting in some woody species in the Kamyshin district.**] *Agrobiologija* 1955 (3), (78–89). 2 refs. [Russ.] I.M.I.

An illustrated account is given of natural root-grafts—(*a*) intraspecific, in *Acer negundo* and *Pinus sylvestris*, and (*b*) interspecific, between *A. negundo* and *A. platanoides*, and between *P. sylvestris* on the one hand and *P. nigra* var. *caramanica* and *P. banksiana* on the other. In (*a*) it appeared that when such unions had taken place between more or less equally developed specimens, both partners continued to grow uniformly but faster than non-root-grafted specimens; whereas if one partner was better developed at the time of root-grafting, it dominated and more or less suppressed its unequal partner. In (*b*) certain root-grafted trees are said to have shown morphological changes, e.g. in stem and crown form, length of needles and number of resin ducts [little detail is given], which are attributed to 'natural vegetative hybridization'.

2561. KOBENDZA, R. Dalsze studia nad zarastaniem ściętych pni drzew. [**Further studies on the healing over of tree stumps.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (1–37). 10 refs. [Pol. russ.e.]

Quotes 3 cases in Poland of callus formation with partial or complete healing-over for *Larix polonica*,

and 1 case for *Pinus sylvestris*. With *Pseudotsuga taxifolia*, the healing-over of felled or broken stems is a relatively frequent phenomenon. In broad-leaved species the process is complicated by the liability of the wood to decay. The callus wood (sapwood and heartwood) and bark formation on *P. taxifolia* stumps is described, including histological detail, and the callus wood of this species is compared with that of *Abies alba*. The healing is explained by natural root-grafting. [Cf. *For. Abstr.* 13 (No. 1035); 15 (No. 154).]

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 2572, 2812.

2562. Oksbjerg, E. Nogle foryngelsesproblemer. 1. Om rodkonkurrence og røddernes udvikling. **[Some regeneration problems. (1) Root competition and root development.]** *Dansk Skovforen. Tidsskr.* 39 (2), 1954 (93–113). 7 refs. [Dan.]

Reports on changes in vegetation on 8 sites (mainly *Picea abies*) in Løndal, central Jutland, occurring on small plots isolated for 2–3 years by trenches from root competition by the main stand. Results were slight in 35-year stands of Spruce (site class 3–3½) and of *Abies alba*. The other plots showed e.g. increase and rapid growth of ground vegetation and improved growth of Spruce regeneration, rapid spread of *Oxalis* or replacement of moss by grass and herbs. Some areas outside the plots were given fertilizer treatment, e.g. with $Ca(NO_3)_2$ or $(NH_4)_2SO_4$. These caused changes rather similar to those on the plots but of short duration. The effect of reduced root competition was highest in old mor plantations and least in mull plantations rich in herbs. A study of root development on these two site types showed respectively a thick mat of roots near the surface with many mycorrhizae, and deeper root development with more long roots and few or no mycorrhizae. A study of mor soils showed an increase in pH values and in nitrate and NH_3 formation after release from root competition. An examination of young Spruce plants showed that, while height growth increased inside the trenched areas, root development was less. A number of 2 + 2 and 2 + 1 plants of different species were planted on a small area in a mixed stand of Spruce and *Abies alba*, and roots from the surrounding stand were kept cut during the first summer after planting. Plants of *Chamaecyparis lawsoniana* and *Abies alba* grew vigorously, while other species (e.g. Norway Spruce, Oak, Birch, Japanese Larch) either failed or grew unsatisfactorily.

181.5. Reproductive Behaviour

See also Nos. 2403, 2477–8, 2629, 2656 *et seq.*, 2696, 2820, 3113.

2563. Moar, N. T. **Adventitious root-shoots of *Dacrydium colensoi* Hook. in Westland, South Island, New Zealand.** *N.Z. J. Sci. Technol.* 37*A* (3), 1955 (207–13). 5 refs. P.R.

Adventitious shoots arising from lateral roots of *D. colensoi* (Silver Pine) in swampy areas are reported. The first leaves of such shoots are similar to adult leaves and these are succeeded by intermediate and then by juvenile leaf forms which gradually undergo transition to adult leaves. The fact that *D. colensoi* is principally a dioecious species assists in deciding whether 'individuals' in clumps with tangled root systems are adventitious root-shoots or plants that have grown from seed. The ecological and practical significance of such shoots is briefly discussed. *From author's summary.*

2564. **Studies on growth and flowering [in *Elaeis guineensis*].** *Rep. W. Afr. Inst. Oil Palm Res. 1954/55*, 1955 (116–22).

Summarizes the results of long-term observations on thousands of Palms over a period of 10 years, under the heads: leaf production, production of inflorescences, floral abortion, sex ratio, production of ♀ inflorescences, periodicity of bunch yielding, and the influence of soil fertility on growth and flowering.

2565. Hussey, G. G. **The germination problem [of *Elaeis guineensis*].** *Rep. W. Afr. Inst. Oil Palm Res. 1954/55*, 1955 (132–5).

It has been shown that the slow germination of Oil Palm seed is not due to any inherent dormancy of the embryo but is the result of inhibiting factors, namely, lack of water and O, in association with a reaction influenced by high temperature.

2566. Pejoski, [B.] *Juniperus excelsa* Bieb. kozalaklarindaki tohum sayisi. **[Number of seeds per fruit of *Juniperus excelsa*.]** *Istanbul Üniv. Orm. Fak. Derg.* 4 (2), 1954 (102–6). 6 refs. [Turk.]

Data from 323 mature fruits collected in S.E. Anatolia, alt. 1500 m., are compared with those from Macedonia [see *For. Abstr.* 14 (No. 2020)]. The Anatolian fruits were somewhat heavier (0·52–0·58 g.), and contained the same range of seed number, 3–13, but the mode was 8, not 4, and the arithmetical mean 7·10.

2567. Goo, M., and Hiramatu, H. **[Seed maturity and germinative power.]** *Bull. Tokyo Univ. For.* No. 48, 1955 (103–11). 8 refs. [Jap.jap.e.]

The course of the drying of cones (2 seasons) and seeds, gathered at roughly 11-day intervals through the growing season, and the development of the embryo and of the germinative capacity of these seeds, sown fresh or stored until winter, is shown in graphs and tables [with English titles and legends] and photomicrographs of embryo development. The species studied were *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Pinus densiflora* and *P. thunbergii*.

2568. Harada, H. **[Influence of moisture condition in the seedbed on water absorption and the germination of the seed of *Cryptomeria japonica* D. Don.]** *Transactions of the Tottori Society of Agricultural Science, Tottori, Japan* 10 (3), 1954 (87–94). 25 refs. [Jap.e.] C.G.B.

When seeds were placed on filter paper in Petri dishes, very dry conditions affected both water absorption and germination, while excess moisture hastened water absorption, but hindered germination, unless the moisture was reduced after the 5th

day, when it hastened it. Germination %s of seeds placed on quartz sand moistened to 20–100% of its field capacity was highest in the 40–80% range. When seeds were placed in saccharose solutions, to test the effect of increased osmotic pressure, germination % at 0·25 mol. was about half that of the control batch (35% *vs.* 68%) and sank to nil at 0·75 mol. Tables and graphs have English titles and legends.

2569. WEGER, Z. O pinheiro brasileiro e a regeneração natural. [***Araucaria angustifolia* and its natural regeneration.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (324–8). 14 refs. [Port.e.]

Observations on the development of *A. angustifolia* grown in full light, grown under shade, or regenerating naturally, indicate that lack of regeneration is due in part to the light-demanding character of the tree, coupled with the heaviness of the seed which causes it to fall near the parent tree.

2570. BAUMGARTNER, A. Licht und Naturverjüngung am Nordrand eines Waldbestandes. [**Light and natural regeneration on the northern margin of a forest stand.**] *Forstwiss. Cbl.* 74 (1/2), 1955 (59–64). 12 refs. [G.g.]

Presents observations made in a Spruce stand on the influence of the mature trees and ground cover in shading the seedlings, and on the light reaching the seed itself on different kinds of seedbed.

2571. BORMANN, F. H. **Ecological implications of changes in the photosynthetic response of *Pinus taeda* seedlings during ontogeny.** *Ecology* 37 (1), 1956 (70–5). 11 refs. [Emory University, Georgia.]

Loblolly Pine seedlings, two or more years old with secondary needles, are known to be poorly adapted to conditions of low light intensity, but little is known of the response of younger seedlings with juvenile foliage. Measurements of apparent photosynthesis were made on 16-week-old seedlings with juvenile needles alone and with a mixture of juvenile and secondary needles. Both sets of seedlings reached maximum rates of photosynthesis at relatively low light intensities. In this respect, young Pine seedlings having a preponderance of juvenile needles were similar to hardwood seedlings and more efficient than older Pine seedlings with secondary needles. Increased mutual shading in older seedlings with secondary needles, and basic differences in the anatomy of juvenile and secondary needles, may account for the difference in photosynthetic response between seedlings with juvenile foliage and with secondary foliage.

Although the first-formed secondary needles appear to be photosynthetically equivalent to juvenile needles, later-formed, fully developed secondary needles are thought to be less responsive to low light intensities.

This shift in the photosynthetic response of Pine seedlings with ontogeny helps to explain the role of the species in nature. (*a*) In old fields, where Pine thrives, young seedlings with foliage dominated by juvenile needles are able to become established under the low light conditions prevailing near the soil under dense weed cover. Later, when less efficient secondary needles predominate in the crown, the plant is taller and exposed to so much more light that its inability to photosynthesize efficiently under low light intensities is probably no great detriment. (*b*) Under dense forest canopies, Pine seedlings can become established because of their ability to utilize low light intensities. Later, when secondary foliage develops, seedlings are unable to photosynthesize effectively under the existing low light conditions. Thus they are unable to compete with the more efficient existing vegetation and, as a result, they die out. *From author's summary.*

2572. FURRER, E. Probleme um den Rückgang der Arve (*Pinus cembra*) in den schweizer Alpen. [**The regression of *P. cembra* in the Swiss Alps.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 31 (3), 1955 (669–705). 105 refs. [G.f.]

From his new observations and the literature, the author concludes that the regression of *P. cembra* is due to the extension of pasture, fire, and overcutting. It cannot compete with Larch, Spruce and other Pines as a pioneer species, since it requires shade and acid soils and therefore occurs at a late stage in forest development. For seed dispersal it is dependent on birds, and is therefore doubly penalized by excess deforestation. Its seeds are also collected for food.

2573. CROSSLEY, D. I. **The production and dispersal of Lodgepole Pine seed.** *Tech. Note For. Br. Can.* No. 25, 1955. pp. 12. 4 refs.

Records of seed production and dispersal were kept for 3 years in a fully stocked, 60-year-old stand of *Pinus contorta* var. *latifolia* in the sub-alpine forest region of Alberta. The following facts were established: (1) Small amounts of Pine seed were released continuously with an annual maximum at the time of cone ripening (4–5 weeks, centring on 1 Oct.). No year was quite without seed shedding, but amounts varied significantly from year to year. Seed was dispersed for at least 5 chains (330 ft.) downwind from the edge of the stand during the snow-free period of the year. Some seed fell during the winter months and was thus in a position to scud for considerable distances over the surface of the snow in favourable conditions.

2574. GARCIA SALMERON, J. M. El cambio de polaridad en la germinación del *Pinus halepensis* y *Stipa tenacissima.* [**Change of polarity in the germination of *P. halepensis* and *S. tenacissima*.**] *Montes, Madrid* 11 (66), 1955 (441–7). [Span.]

Among 1500 seeds, 5 were found in which the position of the embryo within the seed coat had been inverted, and the seed coat was broken by the plumule, and not the radicle, encountering the micropyle.

2575. ALLEN, R. M. **Relation of Saw-Palmetto to Longleaf Pine reproduction on a dry site.** *Ecology* 37 (1), 1956 (195–6). 1 ref. [Southern Forest Experiment Station.]

On a dry ridge in Mississippi, *Pinus palustris* seedlings were found only near clumps of *Serenoa repens.* The beneficial effects of shade from *S.*

repens in protecting seedlings from lethal temperatures is probably responsible for this.

2576. POOLE, A. L. **Recent southern Beech flowering seasons.** *N.Z. J. For.* 7 (2), 1955 (88–9).

Observation shows that heavy flowering of *Nothofagus fusca, N. cliffortioides, N. truncata* and *N. solandri* usually follows very hot summers and is succeeded by heavy mast. *N. menziesii* is anomalous in this respect, only some trees flowering at the same time as the other species while many flower in other years.

2577. CORTI, R. Ricerche sul ciclo riproduttivo di specie del genere *Quercus* della flora italiana. 1. Osservazioni sul ciclo riproduttivo in *Quercus coccifera* L. **[The reproductive cycle of Italian species of *Quercus*. 1. *Q. coccifera*.]** *Ann. Accad. ital. Sci. for.* 2, 1954 (235–64 + 32 photos.) 39 refs. [It.f.]

2578. WINSTON, P. W. **The acorn microsere, with special reference to arthropods.** *Ecology* 37 (1), 1956 (120–32). 25 refs.

Acorns of *Quercus rubra* were collected in all stages of decay for one year and examined for the animals and fungi present. A succession of 5 stages of decay and insect infestation was established. Conditions in the Red Oak/Sugar Maple floodplain forest provide an optimum for decay and the number of surviving acorns is very low, which is a possible factor in the succession from Red Oak to Sugar Maple.

2579. VAARTAJA, O. **Photoperiodic response in germination of seeds of certain trees.** *Abstr.* in *Bull. ecol. Soc. Amer.* 36 (4), 1955 (110). A.P.B.

In germination tests with seed of *Betula verrucosa* and *B. pubescens*, temperature was controlled by running water, and different illumination conditions were provided, partly by fluorescent lighting. At 25°–35° C. seed germinated well, both in darkness and under various light conditions. At 20–25° germination was somewhat decreased by continuous periodic exclusion of light. At 10–20° germination largely depended on photoperiods, high germination occurring only when the daily dark period or periods were ca. 6 hours. Germination was also slightly dependent on illumination intensity (optimum ca. 200 ft.-candles). No light was needed for germination if the seed had been stratified. In tests with other tree species, similar but less pronounced responses to photoperiods were demonstrated.

2580. **Ligno-tuberous advance growth.** *Rep. For. Dep. W. Aust. 1954/55*, 1955 (25).

Jarrah [*Eucalyptus marginata*] regrowth has the peculiarity of resting in a procumbent ligno-tuberous stage for a long period, and a leading dynamic shoot is not sent up, under natural conditions, until a ligno-tuber of 3–4 in. diameter has been developed. This may take 15 years and is rarely < 8–10 years.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 2474–5, 2518, 2617, 2689.

2581. MYCZKOWSKI, S. Harfowe formy jodły pospolitej (*Abies alba* Mill.) w Tatrach. **[The 'harp-like' growth forms of *A. alba* in Tatra Mts.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (499–501). [Pol.]

Describes and illustrates two cases in which the main stem was inclined (in one case almost horizontally), and a number of branches had grown vertically from it forming separate 'stems'.

2582. MYCZKOWSKI, S. Wpływ czynników ekologicznych na kształtowanie się pokroju buka zwyczajnego (*Fagus sylvatica* L.). **[Effect of ecological factors on the morphology of *F. sylvatica*.]** *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (233–51). 28 refs. [Pol.pol.russ.e.]

Discusses the effect of the following factors: soil, frost, drought, wind, snow and ice, light, insect damage, mutual influence of trees, phenological phenomena, shoot growth, and the innate properties of the stem. The basic data are taken both from the author's own researches and from the literature (28 references—Polish and Western European). The following practical conclusions are arrived at: (1) thinnings in pure Beech stands should afford the young stems 25% of full light; (2) stands of better quality are obtained by suitable admixtures (*Abies alba, Picea abies, Larix decidua.*

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

2583. SETTEN, G. G. K. **The largest trees recorded in Malaya.** *Malay. Forester* 19 (1), 1956 (29–32). 6 refs.

Includes a list of over 60 species with girth measurements of the largest recorded specimens.

181.8. Phenology

See also Nos. 2448, 2536, 2556, 2576, 2579, 2688.

2584. HERMAN, F. R. **Growth and phenological observations of Arizona Junipers.** *Ecology* 37 (1), 1956 (193–5). [Rocky Mountain Forest and Range Experiment Station.]

The following phenological data are tabulated for *Juniperus osteosperma, J. monosperma, J. scopulorum*, and *J. deppeana* in Arizona: dates at which (1) bark begins to slip, (2) pollen is shed and ♀ flowers open, (3) leader elongation begins, (4) conspicuous formation of ♂ flowers begins, (5) bark begins to stick, and (6) leader elongation ceases.

2585. DENGLER, A. Über den Zusammenhang zwischen Blütenfarbe und Austreiben bei der Fichte. **[Correlation of cone colour and flushing in Spruce.]** *Arch. Forstw.* 4 (1), 1955 (1–4). [G.]

Gives tabulated data from a provenance trial, showing the % growth added in 5-day intervals (17 May–10 June) for 14 and 13 stems derived respectively from mountain (650–1000m.) and lowland (120 m.) parents. In each case the colour of the cone (red, green, red-green) is noted. Cone colour and earliness of growth were only weakly correlated and with many exceptions.

2586. SÄTTLER, R. Spät- und Frühtreiber bei der Fichte. **[Late- and early-flushing Spruce.]** *Wald* 2 (12), 1952 (377). 5 refs. [G.]

Questions the connexion, mentioned in the literature cited, between green cone colour and late flushing. Of a large batch of 2-year-old plants raised from seed from green cones, only 10% proved to be late-flushing.

2587. FERGUS, C. L. **A note about breaking dormancy of Oak in the greenhouse.** *Plant Dis. Reptr.* 39 (11), 1955 (873). 1 ref. A.P.B.

Three methods were tested: (1) exposure to ethylene chlorohydrin, (2) clipping of all the terminal buds, and (3) exposure to low temperatures (20° and 40° F.). Species used were *Quercus ilicifolia*, *Q. prinoides*, *Q. alba*, *Q. borealis*, *Q. coccinea* and *Q. velutina*. Exposure of seedlings in air-tight containers to a concentration of 18 ml. of 40% ethylene chlorohydrin/100 litres of space was the most convenient and successful of the methods tested although this concentration killed all terminal buds. Success, but in a lesser degree, was obtained by (3). Results with (2) varied in different species.

2588. **Jarrah sylviculture.** *Rep. For. Dep. W. Aust. 1954/55*, 1955 (26).

Observations on the growth and behaviour of second-growth Jarrah [*Eucalyptus marginata*] crowns have shown that new leaves are produced in early summer after the flowering period, and that new flower buds are produced in the axils of the new leaves at the same time. Flowering occurs nearly 12 months later, and the seeds ripen at the end of the following year (two years after bud formation). During the period in which new leaves are forming, the equivalent of a full canopy of leaves from the old crown is falling. Most of the old leaves are shed after 12–15 months but some are retained to fall at 24–27 months. The above data apply to young and healthy trees, but the growth and fall of leaves varies with age, vigour, season, position on the tree, and the incidence of insects, frost and fire.

2589. BUNUŠEVAC, T. Fenološke pojave kod bradavičaste kurike. **[Phenological phenomena in *Euonymus verrucosus*.]** *Glasn. šum. Fak., Beograd* No. 8, 1954 (195–206). 8 refs. [Serb.f.]

Tabulates phenological data observed in two places in Jugoslavia.

181.9. Miscellaneous. (Including the Ecological Rôle after Death of Plants or Parts of Plants, e.g. Dead Trees, Stumps, Fallen Logs)

See also Nos. 2421–2.

2590. SCHIMITSCHEK, E. Forstentomologische Studien im Urwald Rotwald. **[Forest entomological studies in the Rotwald virgin forest.]** *Z. angew. Ent.* 34 (2), 1952 (178–215); 34 (4), 1953 (512–42); 35 (1), 1953 (1–54). 32 refs. [G.g.] I.I.E.

Presents data on vegetation and microclimate, insects and other small fauna, the temperature and moisture content of fallen timber, phases of its decay and the characteristic succession of insect attack.

182. Synecology, Plant Sociology: General, Principles and Methods

2591. TÜXEN, R., and MEISSNER, H. **Bibliographia Phytosociologica Germania, Pars V.** *Mitt. florist.-soziol. Arbeitsgemeinsch. (n.s.)* No. 5, 1955 (204–10). 116 refs. [G.]

[Cf. *For. Abstr.* 17 (Nos. 240–1).] Covers 1953, with one supplementary reference for 1952.

182.1. Palaeoecology. History of Vegetation

See also Nos. 2530, 2602.

2592. DIMBLEBY, G. W. **The ecological study of buried soils [by pollen analysis].** *Extr.* from *Advanc. Sci.* 12 (45), 1955 (11–6).

An extended summary of a paper read at the symposium on Techniques in Archaeology at the British Association meeting, Oxford, 1954, giving examples from Yorkshire, Dorset and Hampshire.

2593. WENNER, C.-G. **Investigation into the possibilities of distinguishing the pollen of the various species of *Betula* in fossil material.** *Geologiska Föreningens i Stockholm Förhandlingar, Stockholm* 75 (3), 1953 (367–80). 7 refs. [E.] L.S.

Results, shown in graphs, of measurements of pollen of Birch, Pine and Cyperaceae from peat in N. Europe showed that the size of all 3 types varied fairly consistently from level to level of the peat, suggesting that size was affected by fossilization. It was not possible to distinguish the different species of Birch.

2594. KRAUSCH, D. Wälder und Wiesen im Spreewald in geschichtlicher Entwicklung. Ein Beitrag zur Vegetations- und Wirtschaftsgeschichte der Niederlausitz. **[Forests and meadows in the Spreewald: their historical development. A contribution to the history of vegetation and management in the Niederlausitz.]** *Wissenschaftliche Zeitschrift der Pädagogischen Hochschule Potsdam (Mathematisch–Naturwissenschaftliche Reihe)* 1 (2), 1954/55 (121–48). 81 refs. [G.g.]

2595. BERTSCH, K. Die Einwanderung der Buche in Südwestdeutschland. **[The immigration of Beech into southwestern Germany.]** *Ber. dtsch. bot. Ges.* 68 (5/6), 1955 (223–6). 8 refs. [G.] O.B.D.

A brief review with particular reference to the new discovery of colonization during the late Stone Age in the region of Ulm.

2596. PARDÉ, J. À propos du hêtre de Valbonne: relique glaciaire ou plantation de moines? **[The Valbonne Beech: glacial relict or monastic plantation?]** *Rev. for. franç.* 8 (1), 1956 (29–38). [F.]

Detailed comparison of the associated flora in this Beech wood with that of an incontestable relict stand near Marseilles, gives strong reasons for believing that it too is a glacial relict.

2597. DUGELAY, A. Note sur l'équilibre de la forêt domaniale de la Sainte-Baume (Var). **[A note on the equilibrium of the state forest of Sainte-Baume, Var.]** *Bull. Soc. for. Franche-Comté* 28 (8), 1955 (414–20). [F.]

Discusses the historical events that have enabled this relict stand of hardwoods and Yew to survive, and the likelihood of its continuance in its present condition.

2598. MEYER, K. A. Frühere Verbreitung der Holzarten und einstige Waldgrenze im Kanton Wallis. IV. Oberwallis. **[Former distribution of tree species and former timberline in the Canton of Valais. IV. Upper Valais.]** *Mitt. Schweiz. Anst. forstl. Versuchsw.* 31 (3), 1955 (563–668 + 8 photos). [G.]
Cf. *For. Abstr.* 15 (No. 3370).

2599. BUNT, J. **Living and fossil pollen from Macquarie Island.** *Nature, Lond.* 177 (4503), 1956 (339). 6 refs. [Antarctic Division, Department of External Affairs, Melbourne.]
It is suggested that the lignites on this island represent the remnants of preglacial flora. Altogether 17 main fossil pollen types were found, and it is of interest that these did not include *Nothofagus* or gymnosperm-type pollens.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 2431, 2572, 2578, 2766, 2781.

2600. VUKIĆEVIĆ-ILIĆ, E., and VESLAJ, V. Vegetacija i zemljište na požarištima Majdanpečke Domene. **[Vegetation and soil on forest-fire sites of the Majdanpek Estate.]** *Glasn. šum. Fak., Beograd* No. 8, 1954 (251–82). [Serb.serb.g.]
Investigations of 10 forest-fire sites, between 1928 and 1946, have shown that: (1) in the *Fagetum montanum* and *Querceto-carpinetum* sites the number of nitrate-indicating plants increases with time; (2) the succession of such vegetation on these sites is: *Epilobium angustifolium, Calamagrostis epigeios, Rubus*, and *Populus tremula*; (3) in *Quercetum montanum* the succession lacks *C. epigeios* and *Populus*.

2601. MCKELVEY, P. J. **A note on the forest edge at Te Whaiti.** *N.Z. J. For.* 7 (2), 1955 (77–80).
Following cessation of indiscriminate burning, there is some re-advance of the forest over fern land at Te Whaiti. A few mechanisms of re-advance are discussed and emphasis is placed on the part played by birds in dissemination of seed. Present successions would appear to lead to formation of scrub hardwood stands, containing scattered Podocarps predominantly of poor form, more rarely to formation of densely stocked Podocarp stands with trees of good form. *Author's summary.*

2602. HENRY, J. E. **Some notes on past forests in the Tokoroa District [of New Zealand].** *N.Z. J. For.* 7 (2), 1955 (81–3). 6 refs.
The charred materials to be found in Taupo pumice are mainly Podocarps, but *Knightia excelsa, Wintera colorata*, and *Olea lanceolata* have been identified. A charred log with soil of pre-Taupo origin attached to roots has been found. The author considers this to have been charred while still standing, and that mass movement of the pumice uprooted it and transported it to its present position. Three egg-cup podzols in Taupo pumice are considered to be evidence that a forest has grown on the Taupo pumice which in recent years has only carried scattered tussock and stunted Manuka. From this it is assumed that soil and climate were suitable to forest growth and that other causes must be found for the presence of the tussock and stunted Manuka associations. *Author's summary.*

182.4. Layer Communities

See Nos. 2562, 2575, 2619–20, 2625, 3083.

182.5. Synecological Measurements and Methods

See also No. 2617.

2603. Service de la carte phytogéographique. **[The [French] phytogeographical survey.]** Centre national de la Recherche scientifique, Paris. 1955. pp. 79 + 3 maps. [F.]
An account of the organization, methods, mapping technique, personnel etc., of the survey, which is engaged in producing (*a*) a vegetation-cover map of France, (*b*) a vegetation-type map, on scales of 1/200,000 and 1/20,000 respectively.

2604. PELUSO, V. A. JR. Diretrizes para elaboração do mapa fitogeográfico de Santa Catarina. **[Instructions for drawing up a vegetation map of Santa Catarina.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (329–40). 9 refs. [Port.]
Outlines a plan for mapping the vegetation of Santa Catarina according to a system similar to that used by Gillman, which is essentially physiognomic, characterizing formations by their dominants. [Cf. *For. Abstr.* 11 (No. 139).]

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

See also No. 2430.

2605. MEISEL-JAHN, S. Die Kiefern-Forstgesellschaften des nordwestdeutschen Flachlandes. **[The plant communities of the Pine plantations of the N.W. German plain.]** *Angew. PflSoziol., Stolzenau* No. 11, 1955. pp. 126 + 8 dgms. 7 pp. of refs. [G.g.]
The main part of the work is devoted to the description and plant-sociological classification of the communities, with consideration of their relation to previous vegetation (especially natural), soil, duration of Pine cultivation, importance as indicators, and distribution over growth regions.

187. Vegetation Types

See also Nos. 2371, 2374, 2377–8, 2392, 2394, 2396, 2400–1, 2498, 2531–2, 2548–50, 2631, 2638, 2653, 3509–10, 3530.

2606. TÜXEN, R., and HENTSCHEL, G. Bibliographie der Vegetationskarten Deutschlands. **[Bibliography of vegetation maps of Germany.]** *Mitt. florist.-soziol. Arbeitsgemeinsch. (n.s.)* No. 5, 1955 (211–47). [G.]
In two parts: (1) published, and (2) unpublished maps.

2607. TÜXEN, R. Bibliographie zum Problem Pflanzensoziologie und Bodenkunde. **[Bibliography**

on the problem of plant sociology in relation to soil science.] *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 5, 1955 (248–55). [G.]

The references are chiefly to European literature.

2608. BODEUX, A. ***Alnetum glutinosae.*** *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 5, 1955 (114–37). 4 pp. of refs. [G.g.f.flem.e.]

An attempt at a clear definition of the *A. glutinosae* from the points of view of floristics, physiognomy and ecology, based on literature and hitherto unpublished information. Four associations are distinguished: *Cariceto laevigatae-Alnetum*, *C. elongatae-Alnetum*, *C. elongatae-Alnetum medioeuropaeum*, *C.e.-A. boreale*, and *Dryopterideto cristatae-Alnetum.*

2609. HARTMANN, F. K. Gliederung der Waldgesellschaften von Nordrhein-Westfalen. [**The forest communities of Nordrhein-Westfalen.**] *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 1, 1954 (31–43). [G.]

The author distinguishes between a mountain region, in which Beech predominates, and a plains and foothills region, with Oak as the characteristic species, and subdivides these, according to soil nutrient content and water regime of sites, in a schematic table. Each sub-association is briefly described and suggestions for suitable species are given.

2610. LOHMEYER, W. Über das *Caricето-Fagetum* im westlichen Deutschland. [**The *Caricето-Fagetum* in western Germany.**] *Mitt. florist.-soziol. Arbeitsgemeinsch.* (*n.s.*) No. 5, 1955 (138–44 + 1 tbl.). 13 refs. [G.]

2611. BRAUN-BLANQUET, J. *et al.* Les groupements végétaux de la France méditerranéenne. [**The vegetation types of Mediterranean France.**] Centre National de la Recherche Scientifique (Service de la Carte des Groupements Végétaux), Montpellier. 1952. pp. 297 + 16 plates. 170 refs. [F.] Price *Fr.*1300.

2612. GUINIER, P. En Provence: réflexions botanico-forestières pour comprendre la forêt méditerranéenne. [**In Provence: some botanical-forestry reflexions for the understanding of the Mediterranean forest.**] *Bull. Soc. for. Franche-Comté* 28 (8), 1955 (391–413 + 8 photos). [F.]

2613. JOVANOVIĆ, B. Fitocenoza *Quercetum confertae-cerris* kao biološki indikator. [**The community *Quercetum confertae-cerris* as a biological indicator.**] *Glasn. šum. Fak., Beograd* No. 8, 1954 (207–19). 19 refs. [Serb.f.]

Considers the case of the forest stand round the town of Kragujevac in Serbia, belonging to the community *Quercetum confertae-cerris typicum*, and termed by the author a 'climatogenic' forest, i.e. one that grows in the average, normal climatic and soil conditions of a region having a characteristic climate and soil; such a forest is little affected by microclimate and relief. This particular forest community is well adapted to a dry summer and a very cold winter. Owing to botanical and topographic differences between the U.S.S.R. and Serbia this 'climatogenic' forest appears in Serbia in climatic conditions that in the U.S.S.R. would favour the formation of steppe or forest-steppe. The Serbian forest contains a large proportion of xerothermic species that are lacking from similar climatic regions of the U.S.S.R.

2614. GAJIĆ, M., KOJIĆ, M., and IVANOVIĆ, M. Pregled šumskih fitocenoza planine Maljena. (Prethodno saopštenje). [**Survey of forest phytocoenoses on Mt. Maljen. (Preliminary communication).**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (255–76). 14 refs. [Serb.e.]

Description of the *Quercus, Pinus, Ostrya carpinifolia/Fraxinus ornus*, and Beech forest communities.

2615. GAJIĆ, M. Prilog poznavanju nizinskih šuma okoline Beograda. [**Bottomland forests in the environs of Belgrade.**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (277–88). 6 refs. [Croat.croat.g.]

Distinguishes and describes the following two communities: *Salicetum albo-amygdalinae* and *Populeto-Salicetum.*

2616. MATUSZKIEWICZ, W., and MATUSZKIEWICZ, A. Materiały do fitosocjologicznej systematyki ciepłolubnych dąbrów w Polsce. [**Systematics of the *Quercetalia pubescentis* associations in Poland.**] *Acta Soc. Bot. Polon.* 25 (1), 1956 (27–72). 31 refs. [Pol.g.] O.B.D.

Compares tabulated data from Poland and other central European countries and concludes that north of the Carpathian and Sudeten Mts. there are found 5 associations belonging to the order *Quercetalia pubescens - sessiliflorae*, viz. *Querceto-Lithospermetum subboreale*, *Coryleto-Peucedanetum cervariae*, *Querceto-Potentilletum albae*, *Quercetum podolicum* and *Querceto-Lithospermetum podolicum.*

2617. NAKANO, M. [**Fundamental experiments on natural regeneration (2). The relation between the vertical distribution [altitude above sea level] and the growth of trees.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 79, 1955 (93–117). 12 refs. [Jap.jap.e.] (Also in *Rep. For. Exp. Sta., Hokkaido* No. 5, 1955 (23–47).)

[Cf. *For. Abstr.* 16 (No. 3780).] On the N.W. slopes of Mt. Taisetu the preponderance of broad-leaved trees suddenly decreases at 600 m. and none are found at 1000 m. *Abies mayriana* occurs from 400 to 1000 m., being most abundant at 600 m. The next [in frequency] is *Picea jezoensis*, less adapted to this environment. *Picea glehnii* and *Betula tauschii* occur from 800 m. upwards, the former being most abundant at 1000 m. and the latter higher still. Raunkiær's law, that in a stable association there are more species with few than with many representatives, and that in European surveys the number of species occurring in 0–20, 20–40, 40–60, 60–80 and 80–100% of observed quadrats is as

$$A > B > C = D < E,$$

was found to apply below 600 m., these ratios for the 400 and 600 m. altitudes being 32 : 5 : 0 : 0 : 1

and 31 : 10 : 0 : 1 : 2 respectively. A table shows the distribution of Raunkiær's life-forms by altitudinal zones, and a list of species occurring in these zones is given with the % of quadrats in which they occur. The best growth of Fir, Spruce and Birch was at 600, 800 and 1000 m. respectively.

2618. YAMANAKA, T. **[Studies on the forest vegetation of Yanaze district, Shikoku, Japan.]** *Research Reports of the Kochi University, Kochi* 3 (10), 1954. pp. 12. 10 refs. [Jap.jap.e.]

Extensive areas are covered by coniferous forests, chiefly composed of *Cryptomeria japonica* and *Tsuga sieboldii*. Deciduous forests, mainly *Fagus crenata*, occur above 1200 m. alt. Nine main communities were analysed. *T. sieboldii/Chamaecyparis obtusa* and *T. sieboldii/Pseudotsuga japonica* are topographical climaxes on shallow soils and rocky slopes; *C. japonica* is absent and Rhododendrons are dominant in the shrub layer. Pure *C. japonica* forests are found on deep fertile soils of flat ridges. *F. crenata/Sasamorpha purpurescens* is a climatic climax forest in the deciduous forest region. Relations between forest communities and habitat are shown diagrammatically. *From author's summary.*

2619. BÜNNING, E. Der tropische Regenwald. **[The tropical rain forest.]** Springer-Verlag, Berlin—Göttingen—Heidelberg. 1956. pp. viii + 118. 1 ref. [G.] Price [14*s.*]

An illustrated description (No. 56 in the popular science series, *Verständliche Wissenschaft*) dealing with the main climatic conditions, special zones (e.g. mangroves), trees, ground flora, climbers, epiphytes etc. and their peculiar characteristics.

2620. GUTZWILLER, R. La constitution des forêts denses équatoriales. **[The structure and composition of dense equatorial forests.]** *Schweiz. Z. Forstw.* 107 (2), 1956 (96–112 + 5 photos). 37 refs. [F.g.]

Reviews current theories on the constitution of such forests, with particular reference to the Belgian Congo and Nigeria as illustrations.

2621. RATTRAY, J. M., and WILD, H. **Report on the vegetation of the alluvial basin of the Sabi Valley and adjacent areas.** *Rhod. agric. J.* 52 (6), 1955 (484–500 + 1 map + 13 photos). E.M.B.

An ecological and botanical survey was made of this area to help in assessing its value for irrigation purposes. An attempt therefore was also made to correlate floristic variations with various geological formations and soils. *Dichrostachys glomerata* is commonly distributed through all soil types, and is likely to spread in the absence of sound veld management. *Acacia* spp. and *Colophospermum* [*Copaifera*] *mopane* occur as local dominants in adjacent areas on the granite sandveld, Paragneiso, Umkondo, alluvium and Permian soil types, where abrupt changes in the vegetation appear to be due to local differences in the soil. The presence of park-like Mopane, and lack of undercover round some of the pans indicate low fertility and probably high salt content. *A. xanthophloea* seems to be a good indicator in the alluvium of badly drained areas or of soils subject to temporary waterlogging. Occurrence of *Isoberlinia globiflora* on the Permian suggests that the drainage on this type of soil is good, but the presence of certain high-veld grasses indicates that fertility may be lower than on the alluvium and basalt soils. *Brachystegia tamarindoides* on the Permian indicates shallow, stony soils, wheras *Ischaemum* spp., *Sorghum* spp. and *Setaria* spp. in the grassland on the basalt indicate high fertility. The Palm groves and the sub-riverine semi-evergreen woodland probably indicate a relatively high water-table. Mopane woodland on the alluvial soils is most frequently associated with *Grewia bicolor*, whereas on the granite soils it is mainly associated with *Combretum apiculatum*. *Acacia* spp., alternating with Mopane woodland, are characteristic of the whole valley area except the riverine fringe. Leguminous trees with edible pods are very common and would be useful as a source of additional cattle food. Of these *A. heteracantha* occurs most frequently.

2622. CROOK, A. O. **A preliminary vegetation map of the Melsetter Intensive Conservation Area, Southern Rhodesia.** *Rhod. agric. J.* 53 (1), 1956 (3–25 + 1 map). 4 refs. E.M.B.

2623. BUELL, M. F., and WISTENDAHL, A. **Floodplain forests of the Raritan River.** *Bull. Torrey bot. Cl.* 82 (6), 1955 (463–72). 10 refs. O.B.D.

Presents a record of the composition of forest remnants in this region of New Jersey.

2624. WHITTAKER, R. H. **Vegetation of the Great Smoky Mountains.** *Ecol. Monogr.* 26 (1), 1956 (1–80). 246 refs.

The sequence of vegetation types (fully analysed) from mesic to xeric at low altitudes is cove forest (mixed mesophytic), Oak/Hickory forest, Oak/Chestnut forest, Oak/Chestnut heath, and Pine forest. In subalpine forests *Picea rubens* is dominant from 4500 ft. to 6000 ft., and *Abies fraseri* above 6000 ft.

2625. BARTON, J. D., JR. **Some observations on the tree strata of an Oak-Hickory wood.** *Proc. Indiana Acad. Sci.* 64, 1954 (88–91). 5 refs. A.P.B.

Observations on an area of 66 acres in N. Illinois. *Quercus alba* was dominant in all areas studied. This dominance was shared by *Q. rubra* at the lower topographic levels, by *Q. rubra* and *Carya ovata* at the intermediate levels, and by *Prunus serotina* and *Carya ovata* at the highest levels.

2626. JONES, J. J. **Conifer swamps of Wisconsin.** *Abstr. of thesis*, in *Dissert. Abstr.* 15 (12), 1955 (2393). [University of Wisconsin.] O.R.S.

Results of a study on 95 conifer swamps.

2627. CHRISTENSEN, E. M. **Ecological notes on the mountain brush in Utah.** *Proc. Utah Acad. Sci. 1954/55*, 32, 1955 (107–11). 21 refs. A.P.B.

Notes on the taxonomic status and natural regeneration of *Quercus gambelii*, with a table showing the relative composition of some mountain brush stands in north-central Utah, the stands being

arranged according to the increasing importance of *Q. gambelii* in the total vegetation cover.

2628. MAACK, R. O aspecto fitogeográfico atual do Paraná. [**The present distribution of vegetation in Paraná.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (33–41). [Port.e.]

Presents a list of the areas within the region occupied by various types of vegetation. Forest originally covered ca. 176,737 sq. km., of which 76,280 sq. km. was *Araucaria augustifolia* forest. About 87,990 sq. km. of the original forest (mainly *Araucaria*) have been destroyed. Annual destruction of the forests is ca. 2500 sq. km. per annum.

2629. RAGONESE, A. R., and CASTIGLIONI, J. A. Os pinheiras da República Argentina. [**The 'Pine' stands of Argentina.**] *An. bras Econ. flor., Inst. nac. Pinho* No. 5, 1952 (73–8). [Port.e.]

Lists the forest species of Misiones and describes shortly the *Araucaria angustifolia* stands of the northern part of the territory. It is remarkable that most of the *A. angustifolia* are mature trees of large size or else very young. Factors adverse to their natural regeneration are briefly discussed.

2. SILVICULTURE

See also Nos. 2364–6, 2522, 3548.

2630. WECK, J. Aufgaben und Möglichkeiten des Waldbaus im Gefüge der Volkswirtschaft autonomer Staaten in den Tropen. [**Silvicultural tasks and possibilities in the economy of autonomous tropical countries.**] *Z. Weltforstwirt.* 18 (3), 1955 (92–105). 14 refs. [G.g.e.]

Discusses (almost exclusively in an Indonesian context) timber plantations, the bringing under management and enrichment of protection forests, the exploitation of virgin dipterocarp forests and the afforestation of wastelands, particularly of *Imperata cylindrica* near towns. Stresses the need for good road systems, and warns against hasty mechanization and forest destruction through wasteful exploitation coupled with shifting cultivation and burning.

2631. MOSER, L. Impostazione naturalistica della selvicoltura alpina. [**Natural bases of silviculture in the Alps.**] *Ann. Accad. ital. Sci. for.* 3, 1955 (79–143 + 16 photos + 1 map). 76 refs. [It.f.]

Describes and discusses the vegetation types occurring in the alps of Lombardy and the Trentino, and the ecological characteristics of the principal forest tree species. The distribution of Beech is closely dependent upon relative humidity of the air. The effects of human intervention are described, and desirable silvicultural practices recommended, with particular emphasis on the value of introducing and encouraging auxiliary species.

2632. LEIBUNDGUT, H. Waldbau im Privatwald. [**Silviculture in private forests.**] *Repr.* from *Schweizerische Landwirtschaftliche Monatshefte, Bern-Bümpliz* 32 (1), 1954. pp. 19. 3 refs. [G.]

A lecture reviewing in general terms the special silvicultural conditions and possibilities in private forests in Switzerland.

2633. DANNECKER, K. Aus der Hohen Schule des Weisstannenwaldes. [**The Silver Fir forest, high school of forestry.**] J. D. Sauerländer's Verlag, Frankfurt a/M. 1955. pp. xi + 206. 141 refs. [G.] Price *DM.*22.

A monograph, devoted mainly to a description of the Fir forests of S.W. Germany, both pure and in mixtures with Beech and Spruce, with a discussion of the various silvicultural systems to which they have been subjected, and numerous examples of the conversion of various types of forests to mixed selection, considered the most suitable system, particularly for the smaller holdings. Reduction of game is advocated as a condition of success.

2634. CROSSLEY, D. I. **Lodgepole Pine studies at the Strachan Experimental block in Alberta.** *Tech. Note For. Br. Can.* No. 19, 1955. pp. 13.

Gives a short account of the studies on Lodgepole Pine ecology, regeneration etc., started in 1951 with the object of determining the best silvicultural practices for thinning, harvesting, and regenerating this species.

2635. ROGERS, R. L. Problemas silviculturais da *Araucaria angustifolia.* Relatório ao govêrno do Brasil. [**Silvicultural problems of *A. angustifolia.* Report to the government of Brazil.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (308–59). [Port.e.]

The report was made at the joint request of FAO and the Brazilian Government. Objects of study were the silvicultural requirements of *A. angustifolia*, existing resources, present exploitation and reforestation, possibilities of natural regeneration, management for sustained yield and possibilities of planting in deforested areas. Among the recommendations made are the following: (1) An area of at least 100,000 ha. should be set aside in Minas Gerais, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul, to serve as a source of seed supply, seed being required in very large quantities. (2) A minimum of 100,000 ha. of exploited forest should be declared national forest in order to allow young regeneration to develop to maturity. (3) An annual planting programme of 20,000 ha. should be undertaken. (4) The Instituto Nacional do Pinho should set up centres for silvicultural research, to be located in Itanguá (São Paulo), Fernandes Pinheiro (Paraná), Três Barras (Santa Catarina) and Passo Fundo (Rio Grande do Sul). The objects of research are reviewed. (5) The Institute should also make a study of rational utilization of this species and the possible exploitation of other species.

2636. O relatório Rogers e o trabalho do Instituto Nacional do Pinho. [**The Rogers report**

and the work of the Instituto Nacional do Pinho.] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (360–70). [Port.]

Reviews briefly, in connexion with the report, some of the experimental work already done by the Institute.

2637. KOHOUT, R. Plantações de *Araucaria angustifolia* no campos paranàenses. **[Plantations of *A. angustifolia* in deforested areas of Paraná.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (378–82). [Port.]

Notes on necessary depth of soil, soil preparation, seed selection, spacing, tending, thinning and de-development of the trees.

2638. TAKLE, G. G., and MUJUMDAR, R. B. **Increasing growth and regeneration of Teak.** *Indian For.* 82 (1), 1956 (8–21). 29 refs.

Reviews the ecological status of mixed Teak forests in Madhya Pradesh, the current silvicultural methods (with special reference to thinning) and the state of natural regeneration. Some figures are given for growth and yield.

2639. SALA, F. Il miglioramento della pioppicoltura. **[The improvement of Poplar-growing.]** *Monti e Boschi* 7 (2), 1956 (51–8). [It.]

Gives a short historical account of Poplar-growing in Italy and describes the progress made during the past 20 years by the co-operation of the Istituto di Sperimentazione par la Pioppicoltura and the Ente Nazionale per la Cellulosa e per la Carta.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 2633, 2650–2, 3114–5, 3138, 3526–7, 3537.

2640. MEYER, W. H. **Some treatment effects on Loblolly and Shortleaf Pine reproduction.** *J. For.* 53 (12), 1955 (895–900). [Yale University, New Haven, Conn.]

Eighty-acre blocks of second-growth Pine were cut each year, 1946–51, under the following treatments: (1) clear felling; (2) retaining 4 seed trees/acre; (3) retaining 8 seed trees/acre; (4) retaining a shelterwood of 25 sq. ft. b.a./acre; and (5) retaining a shelterwood of 40 sq. ft. b.a./acre. Each treatment was divided into burned and unburned plots. The history of the regeneration of the 1946 block (cut in a fair seed-year) and of the 1947 block (cut in an excellent seed-year) is here statistically examined on the basis of (*a*) seedling counts, (*b*) % of stocked quadrats, (*c*) ratio of (*a*) to (*b*), and (*d*) height of the best seedling per quadrat. Conclusions are drawn on the conditions required for the successful establishment of the natural regeneration of these two Pines (not distinguished as to species). The importance of an ample supply of seed and good initial germination was clearly greater than that of all other factors. In general, burnt plots in all treatments gave better results than unburnt.

2641. WENGER, K. F. **Seed tree requirements in Loblolly Pine.** *Sth. Lumberm.* 191 (2393), 1955 (116–8).

A discussion of the factors affecting (*a*) seed production, such as the choice of suitable dominants or co-dominants, and stimulation of cone-bearing through release 2 or 3 years before the final logging, and (*b*) germination, such as baring of the soil through logging operations, burning after, or disking before these. It is estimated that for medium sites in a medium year, 9 carefully selected trees/acre would produce an adequate number of seedlings after disking. Figures are based on data collected at the Tidewater Forest Research Centre, Virginia.

2642. TROUSDELL, K. B. **Loblolly Pine seed-tree mortality.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 61, 1955. pp. 11.

In a 10-year-old management experiment in Virginia, in which 8 seed trees/acre were retained for an average period of 3·3 years, damage by logging and (where practised for seedbed preparation) burning, accounted for about half of the seed-tree mortality, the remainder being due chiefly to wind and lightning. Total mortality rose from $< 1\%$ to $1{\cdot}75\%$ a year when only two 'insurance' trees were left per acre after the removal of the other seed trees, chiefly because the absolute loss from lightning remained fairly constant. This practice is therefore deprecated as inadequate and wasteful. *From author's summary.*

2643. FENTON, R. H. **Windthrow a hazard in Virginia Pine strip cuttings.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 53, 1955. pp. 3.

Figures are tabulated for loss by windthrow and breakage as a result of hurricane 'Hazel' on uncut strips in recently cut Virginia Pine/hardwood compartments in the Beltsville Experimental Forest. Virginia Pine was far more susceptible to damage than Pitch Pine in the compartments examined. The greater volume losses were in larger size classes, $3{\cdot}5\%$ in 5–9 in. d.b.h. classes and $8{\cdot}3\%$ in 9 in. and over. A study shows that cumulative loss from smaller storms over a 2-year period is nearly equal to that from the hurricane. In both hurricane and storm damage, losses from breakage exceed those from windthrow.

2644. HOSOI, M. **[Studies on the natural regeneration of *Pinus densiflora* under clear-strip system. (On the influence of forest edges on the density and the growth of natural seedlings).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (35–72). 26 refs. [Jap.jap.e.]

Plots 4 × 25 and 4 × 50 m. were laid out across cleared strips respectively 25 and 50 m. wide with intervening bands of uncut forest ca. 20–25 m. wide. The long sides of the plots lay N.N.W.–S.S.E. [the location of the investigation being at 35° N. lat. in Japan]. Comprehensive tables give the occurrence of tree and undergrowth species by 2-m. intervals along the plots and the natural regeneration of *Pinus densiflora* is analysed in tables and graphs at the same interval and separately for seedlings of more and less than one year and for the years 1947 to 1952 separately. The duration of direct solar radiation

(annual and growing season) is studied in 5-m. intervals along the plots with special reference to the effects of forest edge and of obstructions (vegetation, topography). Regeneration of the Pine less than one year old was adequate on all plots, the forest edge showing no marked effect on numbers though these were greater on the south side of the narrower strips. Average numbers varied from 1·0 to 2·1/sq. m. No close relation was seen between forest edge and the height of these seedlings, and survival rates differed widely and independently of forest edge. The number of seedlings of more than one year per sq. m. increased from 0·5–2 in 1947 to 4·7–7·5 in 1952, this increase being of the same order in all plots. There was generally a close relationship between the number of seedlings and the sum of the heights of seedlings one year old. Forest edge definitely affected maximum height, the greatest reduction of height, and the greatest area so affected, being at the southern end of the plots. This area was increased by various obstructions. As compared with the open, such areas had only 35 and 50% of the direct solar radiation of the year and of the growing season respectively. This condition covered more than half the 5 × 25 m. plots with correspondingly reduced height-growth. Such areas require special weeding to reduce competition during early life.

2645. SAVRAN, K. Cam, göknar, kayın karişik meşçerelerinde, şeritlerde tıraşlama tensil kesimi araştırmaları. **[A first-year progress report on [experiments in high-forest] clear-cutting in alternate strips with natural regeneration.]** *Bolu Orm. Araşt. Istasyon Müd. tek. Bült.* No. 3, 1954. pp. 15 + 3 dgms. 5 refs. [Turk.turk.e.]

The purpose of these experiments was to discover a silvicultural system better calculated to perpetuate the commercially valuable but light-demanding Pine [*Pinus sylvestris*] in the mixed forests of the Black Sea region than the single-tree selection currently practised. In a stand of 85% Pine and 15% Beech and Fir in equal proportions (mean ht. 25 m., understorey Beech and Fir) at 1470 m. alt. on a 1/5 W. slope in the Büyükdüz Experimental Forest, Karnbük district, two strips 100 m. long and 50 m. wide, and separated by a 50 m. uncut strip, were clear felled in autumn 1952. Four 50 × 50 m. plots were made on the two strips and treated as follows: (1) slash and soil cover left as they were; (2) slash scattered over the plot and burnt together with the soil cover; (3) slash and soil cover cleared and soil harrowed; (4) as (3), but soil harrowed in strips 50 cm. wide at intervals of 2 m., exposing the mineral soil; a fifth plot was kept in the unfelled strip, as control. After clear-cutting in autumn 1952, counts were made of fresh [Pine?] seedlings in each plot from June to Oct. 1953 (tabulated and graphed). These showed no significant difference in numbers or quality of seedlings between plots (1) to (4) but in the control plot about half of the seedlings had died by July and all by August. Total survival by October, viz. 36,800 out of 69,200/ha., was sufficiently encouraging to justify continuing and extending the experiments on a full statistical basis.

2646. BRUUN, J. Plenterhieb og Femelschlag: indtryk fra schweizisk skovbrug 1954. **[The selection and irregular shelterwood systems: an impression of Swiss forestry, 1954.]** *Dansk Skovforen. Tidsskr.* 40 (5), 1955 (225–58). 14 refs. [Dan.g.]

Describes the two systems in Switzerland, compares the climates of Denmark and Switzerland, and concludes that neither system is very suitable for Denmark.

2647. LANDBECK, H. Über die Buchenplenterwälder in Nordthüringen. **[On Beech selection forests in N. Thuringia.]** *Wald* 2 (8; 9), 1952 (244–7; 279–82). [G.]

Describes both the traditional working by the communal owners and later management; development, amount and composition of growing stock; increment/ha. and by diameter classes as compared with a neighbouring even-aged forest; cutting cycle, past and present annual cuts etc. Yield compares favourably with even-aged forest, but young growth is considered low owing to overstocking.

2648. DRISKO, W. **A study of the effects of the application of marking rules upon stand conditions in a Spruce-Fir forest in Eastern Maine.** *Tech. Note Univ. Me. For. Dep.* No. 40, 1956. pp. 2.

Marking of all timber for cutting was instituted in 1948, when the present system of management was introduced—80-year rotation, 9-in. diameter limit, and a 20-year cutting cycle for Spruce. The main objects are being attained, but Hemlock should be included in the allowable cut, and the marking rules could safely state that a maximum of 60% of the volume may be removed instead of the present 50%.

222. Coppice, Pollarding and Lopping Systems

See also No. 2764.

2649. ROTH, E. R. **Decay following thinning of sprout Oak clumps.** *J. For.* 54 (1), 1956 (26–30). 5 refs.

Tabulates 16 years' observations [see also *For. Abstr.* 5 (p. 59)] after the thinning of stems of 374 mixed Oak coppice stools by various methods (illustrated): cuts, at the crotch, flush with saw; ditto with axe; horizontal with saw; breast-height girdling; and cutting with axe leaving a 2-in. stub above the crotch. Data are given for the % of trees decayed under each treatment, classified by wound widths and by crotch type ('U' with separated and 'V' with united sapwood); % flush-cut wounds closed after 16 years, by wound diameter; and diameter growth compared with unthinned controls. Recommendations are: Oak coppice up to 3 in. d.b.h. can be cut in any convenient manner without incurring decay risk. Larger shoots fall into the same category if the crotch is of the wide U-type. All cuts should be made with a saw (to minimize bark damage) keeping the wound diameter as small as possible by a horizontal or slightly sloping cut. Stubs should never be left. Where shoots are > 2 in. d.b.h. and the crotch is of the V-type all or none should be cut.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 2633, 2770.

2650. RAJIĆ, S. Prispevek k vprašanju pomlajevanja jelke na Kočevskem Rogu. [**Regeneration of Silver Fir on Kočevski Rog.**] *Gozd. Vestn.* 13 (8), 1955 (225–35). [Sloven.sloven.]

Recommends transforming even-aged, pure Spruce and Beech into selection stands, with simultaneous introduction of *Abies alba*. In seed years the soil should be thoroughly prepared. The canopy density above Fir regeneration ought not to exceed 0·3–0·5; young Firs should be protected from wind.

2651. SHIRAISHI, A. [**The results of management of the 1st Anakawazawa Experimental Forest mainly consisting of many-storied stand of Hiba.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (17–25). 3 refs. [Jap.jap.e.]

Describes the conversion of unmanaged *Thujopsis dolabrata* forest into intensively managed selection forest, with tables and graphs (English captions) showing the change in growing-stock volumes, diameter distribution, and increment, the data being derived from cuts made in 1914, 1925, 1932, 1939 and 1951. Growing-stock volume had improved at the second cut and was maintained thereafter at 300–400 cu.m./ha. Initial diameter class ratios (> 52, 22–50, < 20 cm.) were 31 : 62 : 7 and finally 49 : 43 : 8.

2652. SHIRAISHI, A. [**The results of management of Sunakawazawa Experimental Forest mainly consisting of old single-storied stand of Hiba.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (27–34). 3 refs. [Jap.jap.e.]

Presents data on conversion to intensively managed selection [cf. preceding abstract]. The data are derived from cuts made in 1929, 1939 and 1952. The operation's success is still in doubt and more artificial regeneration has had to be undertaken than in the other case.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 2582, 2775, 3073, 3100, 3114, 3120, 3135–8, 3152–3, 3537.

2653. ONNO, M. Forstlich-pflanzensoziologische Betrachtungen über das Revier Klauswald in Niederösterreich.] [**Silvicultural and ecological observations in the Klauswald forest district, Lower Austria.**] *Ber. dtsch. bot. Ges.* 68 (8), 1955 (345–51). [G.g.] O.B.D.

The district of Klauswald in the limestone Alps of lower Austria (alt. 600–1100 m.) has hitherto been afforested mainly with Spruce, which regenerates only with difficulty. A study of the plant communities of this region indicates, however, that it lies within the area of the *Abieto-Fagetum* and that therefore Beech and Silver Fir should be encouraged or introduced in an effort to build up quasi-natural stands. In many parts of the district the vegetation indicates wet soil conditions that would be suitable for moisture-loving species particularly the 'Drapal' Poplar.

2654. RÜHL, A. Die Edellaubholzstandorte des Hochsauerlandes. [**Sites for valuable hardwoods in the mountains of the Sauerland.**] *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 1, 1954 (42, 44–9). [G.]

A description of the vegetation types of fresh and moist sites of the region, which are suitable for species such as Ash or Sycamore Maple with notes on the soils, ground vegetation, topography, and climate.

2655. BINDSEIL. Pflege der Waldränder. [**Care of forest margins.**] *Forst- u. Holzw.* 10 (22), 1955 (457–9). [G.]

Deals with their function for both forest and field, particularly their importance for birds, their composition—a three-storeyed zone of at least 15 m. width is recommended—and tending.

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 2524, 2562, 2569 *et seq.*, 2629, 2640–2, 2644–5, 2685, 2844, 2855, 3004, 3138.

2656. OLBERG, A. Die standörtlichen Voraussetzungen und die waldbauliche Ausnutzung der Kiefernnaturverjüngung. [**Site requirements for, and silvicultural use of, natural Pine regeneration.**] *Forst- u. Holzw.* 10 (22), 1955 (451–4). [G.]

Discusses the natural conditions (chiefly sandy or degraded soils preventing competition from ground flora, and good water supply) and the economic conditions, for the use of natural regeneration of Pine. Owing to the long period necessary—at least 15 years—for removing the old stand, and the logging damage and loss of increment involved, the use of natural regeneration is likely to be economically sound only in stands between 60 and 90 years of age, carrying a high % of valuable timber.

2657. RAVE. Betrachtungen über Kiefernnaturverjüngungen. [**On the natural regeneration of Pine.**] *Forst- u. Holzw.* 10 (8), 1955 (163–5). [G.]

A general discussion, based chiefly on the author's own experiences, touching upon the advantages or disadvantages of natural regeneration compared with clear felling and planting on various sites, the protection of young growth, including the use of natural Birch and retention of some of the old crop as standards, the preparation of the soil etc.

2658. KOLEHMAINEN, V. A. Havaintoja kulotuksen merkityksestä metsiemme uudistamisessa. [**On the effect of burning on regeneration in Finnish forests.**] *Silva fenn.* No. 85, 1955, pp. 32. 7 refs. [Fi.g.]

Young Pine sown on clear-fellings after burning in the Tuomarniemi instructional forest were generally higher than on unburned plots, and there were fewer gaps. Beneficial results of burning could also be observed on older stands of Pine established by sowing, and of Spruce, Larch, and figured Birch, established by planting. Birch

regenerated freely (and occasionally too much so) on burned plots, even after a lapse of several years. Regeneration of Pine under seed trees was adequate after burning, but not without burning. Further advantages of the method are a reduction in the thickness of the raw-humus layer and in the number of injurious fungi and insects, and also facilitation of forest work. *From author's summary.*

2659. CROSSLEY, D. I. **Mechanical scarification to induce White Spruce regeneration in old cut-over Spruce stands.** *Tech. Note For. Br. Can.* No. 24, 1955. pp. 13. 5 refs.

During the summer of 1950, light mechanical equipment was used to scarify the forest floor under an inadequately regenerating residual stand of Spruce (*Picea glauca*) and Poplar (*Populus balsamifera* and *P. tremuloides*) in Alberta. The results four years later indicated that scarification had improved the quantity of Spruce regeneration but was relatively expensive (6 tractor-man hours/acre), and also stimulated the growth of competing vegetation. There was little Poplar regeneration after scarification.

2660. SCHMIDT, R. L. **Some aspects of Western Red Cedar regeneration in the coastal forests of British Columbia.** *Res. Note B.C. For. Serv.* No. 29, 1955. pp. 10. 11 refs.

A review of the literature and examination of sample plots on many sites, lead to the following conclusions:—Regeneration of Cedar (*Thuja plicata*) from seed is largely a failure in undisturbed commercial stands, probably owing to excessive mortality in the early stages. Cedar can, however, reproduce successfully from seed on open areas disturbed by logging, windthrow, or fire. Vegetative reproduction by natural layering (also observed in *Chamaecyparis nootkatensis* and *Abies lasiocarpa*) is common, and in very dense stands may be fully as important as reproduction by seed. Advance growth of Cedar is seldom as abundant as that of *Tsuga heterophylla* and *Abies amabilis* but, once established, it lives longer and is more resistant to insects and disease. These observations indicate that Cedar does not possess all the qualities usually associated with a very shade-tolerant species.

2661. **[Encouraging natural regeneration of Hoop Pine.]** *Rep. Dir. For. Qd. 1954/55*, 1955 (11).

In Dec. 1953 there was a heavy and general seedfall of Hoop Pine [*Araucaria cunninghamii*] and a series of experiments was laid down in an effort to assist the establishment of natural regeneration. Treatments included: (*a*) cutting of scrub species, (*b*) cutting and burning of scrub species before seedfall, and (*c*) cutting of scrub species to reduce canopy after germination had been obtained. In some plots the catch of seedlings was 200,000/acre, with the highest figures in (*b*) plots. In spite of excellent weather, regeneration has persisted on only 17 out of 72 plots and the highest survival is 60,000/acre; 12 out of the 17 plots were untreated controls. The main causes of mortality were insolation, drought, browsing by wallabies and chewing by grasshoppers.

2662. **[Charcoal-burning as an aid to regeneration.]** *Rep. For. Dep. Trin. Tob. 1954*, 1955 (17).

Charcoal burners play an important part in the natural regeneration programme in Trinidad, and the extension of the shelterwood system is being made more difficult by the absence of sufficient charcoal burners. Experiments in poison frill-girdling with Na arsenite combined with shrub- and climber-cutting were not very satisfactory and proved expensive—$16·7/acre compared with a *revenue* of $2–3/acre where charcoal burners did the work. Experiments in the enrichment of natural forest regeneration by the sowing or planting of exotics indicate that the introduced species should be fast-growing light-demanders and must be sown or planted just after the charcoal burner moves on. The best sites are round the levelled charcoal pits where all natural regneration and dormant seeds have been killed by the heat and disturbance. The most promising species are *Simaruba amara*, *Nauclea diderrichii*, *Tabebuia pentaphylla* and *Chlorophora excelsa*. *Terminalia superba* is severely checked when transplanted, but may succeed if it starts vigorous growth before the rapidly growing indigenous species overtake it.

2663. LANZ, R. Das Problem der natürlichen Schwarzerlenverjüngung. **[Natural regeneration of *Alnus glutinosa*.]** *Schweiz. Z. Forstw.* 107 (1), 1956 (27–36). 26 refs. [G.]

A review of the literature.

2664. STOECKELER, J. H., and MACON, J. W. **Regeneration of Aspen cutover areas in Northern Wisconsin.** *J. For.* 54 (1), 1956 (13–6). 9 refs.

From a wide reconnaissance of 46 areas of *Populus tremuloides* and *P. grandidentata* systematically sampled 2–9 years after logging, the following conclusions are drawn: root-sucker regeneration was 7·5 times as abundant and had 3·4 times the height growth in the open (91–100% full sunlight) as in heavy shade (10 or 20%). The former condition was attained with a basal area/acre of residual top cover < 16·5 sq. ft.; Aspen is capable of producing good stands of regeneration when the original stocking is as low as 3 cords/acre, but original stocking has less effect than light, e.g. the number of sprouts/acre after felling 9 and 3 cords/acre was as 1·2 : 1. The average number of sprouts/acre declined from 6825 at 2 years to 890 at 9, owing to shade, competition, frost, mammal and insect damage and disease. Good sites have considerably more and higher sprouts. Felling in late summer reduced the number of sprouts by 25% as compared with dormant-season or spring felling. Best subsequent height growth came from dormant-season felling, but the contrast in stocking was not great enough to exclude the later-season fellings. Conversion to shade-tolerant northern hardwoods and Balsam Fir was occurring on a rather high % of the areas and this was greater on good sites than on poor (ratio of 3 : 1); approximate criteria for adequate regeneration (figures in minimum % of milliacres stocked and sprouts/acre) at 2, 4, and 9 years were respectively: 85%, 4625; 60%, 1450; and 43%, 925—the per-acre

figures being derived from the relation of % milliacres stocked to the total population of the same milliacres. Previous studies have indicated financial rotations ranging from 55 to 40 years on sites with indexes ranging from 80 to 50. In this area a reduction of 5 years in these rotations is considered proper and on this basis about 22% of the tracts were felled 10 or more years too early and 15% equally too late.

232. Artificial Regeneration

232.1. Choice and Trial of Species, Races etc.

See also Nos. 2755–6, 2758–9, 2764, 2767–9, 2901.

2665. ACKERS, C. P. **Whither away?** *Quart. J. For.* 50 (1), 1956 (51–7).

A further contribution to the subject of growing quality softwoods [cf. *For. Abstr.* 16 (Nos. 4075–6)]. The author protests against the condemnation of *Sequoia sempervirens* and *Abies grandis*, and recommends growing the former in any suitable areas in S.W. England. *A. grandis* grown on suitable soil and in the right locality also produces useful timber.

2666. BROWN, C. S. **Which Poplar to plant?** *Quart. J. For.* 50 (1), 1956 (29–33 + 3 photos).

Notes on a few hybrid Poplars recommended for planting in Great Britain.

2667. MOLTESEN, P.; HERMANSEN, N. K. Om træartsvalg. [**The choice of species.**] *Dansk Skovforen. Tidsskr.* 40 (1), 1955 (1–32). [Dan.]

Two paper read at the 1954 meeting of the Sydsjællands og Lolland-Falsters Skovkreds, on choice of species among those commonly grown in Denmark on the basis of (1) technological properties of the wood and (2) economics.

2668. BAVNGAARD, A.; HERMANSEN, N. K. Om træartsvalg. [**Choice of species.**] *Dansk Skovforen. Tidsskr.* 40 (3; 5), 1955 (94–106; 216–24). [Dan.]

Comments on a paper by Hermansen [see preceding abstract] and urges that the susceptibility of Spruce to *Fomes annosus* and wind damage and the cost of regeneration make it less profitable as compared with Beech than direct calculations of yield suggest. With a reply by Hermansen.

232.11. Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.

See also Nos. 2520, 2522, 2537, 3118–20.

2669. RADLER, F. Anbauversuche mit *Sequoia gigantea* am Niederrhein. [**Trials with *S. gigantea* in the Lower Rhine region.**] *Holz-Zbl.* 82 (6), 1956 (55–6). 11 refs. [G.]

The author describes small-scale trials in the non-devastated forests along the German-Dutch border, near Kaldenkirchen, where Pine, so far the chief species on the sandy soils of the Maus-Rhein terrace, does rather poorly because of the climate (mean average precipitation 725 mm.). Some of the *Sequoia*, raised from seed in 1948 in mixture with *Libocedrus decurrens* and *Abies concolor* var. *lowiana*, its natural associates, have reached a height of 3 m. and a d.b.h. of 7 cm. There were early setbacks, chiefly because of the susceptibility of young plants to fungus attacks (*Botrytis cinerea*). Among ca. 750 species tried in this experimental garden, *Sequoia sempervirens*, *Metasequoia glyptostroboides*, *Cryptomeria japonica*, *Picea omorika* and *Pinus griffithii* have shown promise. Yields, timber properties and timber uses of *S. gigantea* are discussed. [Cf. *For. Abstr.* 17 (Nos. 170, 1451).]

2670. WENTZEL, K. F. Die Weisstanne im Rheinland. [***Abies alba* in the Rhineland.**] *Forst- u. Holzw.* 10 (8), 1955 (156–9). 14 refs. [G.]

A general discussion of the prospects of *A. alba* in the region, and a plea for its more extensive use, particularly in the mountains east of the Rhine, citing its successful use in the conversion of Beech and Oak coppice to high forest at Pilghausen, where Firs have reached average height of ca. 4 m. in 12 years from planting.

2671. KRAMER, H., and STREHLKE, B. Zum Anbau der korsischen Kiefer. [**The cultivation of Corsican Pine.**] *Forst- u. Holzw.* 10 (21), 1955 (440–2). [G.]

Reports on a tour through Belgian stands of *Pinus nigra* var. *calabrica*, aged from 6 to 50 years, and on their establishment, tending, yields, provenance, site conditions, etc. Its better growth and yield, and greater fume-resistance compared with Scots Pine, commend Corsican Pine for industrial areas in Germany having similar site and climatic conditions.

2672. REFISCH. Die Corsische Kiefer. [**Corsican Pine.**] *Forst- u. Holzw.* 10 (24), 1955 (495–6). [G.]

Describes (mostly pure) stands on sandy soils at Westerlo, in the Nethe region of Belgium, their establishment and development. Yield of a 54-year stand exceeds that of Wiedemann's Class I in Scots Pine, but there is a tendency to branchiness (unimportant, as most stands are harvested for mine timber). Underplanting with *Quercus borealis* and *Castanea* to combat the formation of raw humus looks promising. The only disease, a root fungus (*ronde de sorcière*) [*Fomes annosus*?], is controlled by digging trenches round the affected trees.

2673. ROISIN, P. La Calestienne—le pin noir d'Autriche. [**Austrian Pine in La Calestienne.**] *Bull. Soc. for. Belg.* 62 (12), 1955 (505–25). [F.]

Describes the vegetation etc. of this district on the northern edge of the Ardennes, describes the plantations of Austrian Pine, and gives some data on their increment and yield.

2674. ABELL, J. Lokale Douglasovervejelser. [**Douglas Fir in Denmark.**] *Dansk Skovforen. Tidsskr.* 39 (1), 1954 (1–60). [Dan.]

A number of sites growing 21- to 34-year Douglas Fir, pure or mixed with Norway or Sitka Spruce, were examined. Height measurements on sites with Norway Spruce site classes (after C. M. Møller) ranging from 4 (poor) to 0·0 (very good) showed a comparatively small range for Douglas (16·1–19 m.) and a larger one for Norway Spruce (7·5–16·5 m.). Greater use of Douglas on warm sandy soils is recommended. The following recommendations

are made for planting in mixture with Norway Spruce: (1) On Norway Spruce sites of classes 0·0–1·5 the two species should be planted simultaneously, and on those of classes 1·5–2·5, and > 2·5, Douglas should be planted 2 years and 3–4 years later respectively. (2) On good Norway Spruce sites Douglas should be planted at a rate of 1 : 6, i.e. about 1300 Douglas plants/ha., on poorer sites at 1000–2000/ha. and on the poorest sites at 3000–4000/ha. Douglas may be planted in pure stands in sheltered, sunny positions, on warm, deep, gravel or sandy soils containing small amounts of clay. Rates of 4000–5000/ha. 1 + 1 or 2 + 1 plants on lighter soils, and 6000–7000/ha. on those containing more clay are recommended. The sites of the different stands investigated are described in some detail, and data on their development until 1953 and probable future development are given.

2675. STEFANSSON, E. Främmande barrträd i norrländskt skogsbruk. **[Introduced conifers in Norrland.]** *Svensk PappTidn.* 58 (23), 1955 (868–78). [Sw.] P.R.

Gives brief particulars of species tried in different parts of Norrland. *Abies sibirica*, *A. lasiocarpa*, *Pinus contorta* var. *latifolia* and *Larix sibirica* are among the most promising of those tried fairly extensively.

2676. SCHMIDT-COLINET. Die Omoricafichte in Finnland. **[*Picea omorika* in Finland.]** *Forst- u. Holzw.* 10 (12), 1955 (248–9). 6 refs. [G.g.]

An article based chiefly on personal communications from O. Heikinheimo. In Finnish experimental stands, height growth and yield were less than for *P. abies*. Frost injuries after the hard winter of 1939–40 were not severe in the majority of trees observed, and rarely fatal.

2677. STIELL, W. M. **The Petawawa plantations.** *Tech. Note For. Br. Can.* No. 21, 1955. pp. 46. 18 refs.

Gives data on site requirements, survival, height growth, self-pruning, and response to competition for *Picea glauca*, *Pinus resinosa*, *P. banksiana*, *P. strobus* and *P. sylvestris*, obtained from 1000 acres of plantations established between 1922 and 1940 at Petawawa Forest Experiment Station.

2678. STOATE, T. N. **Some aspects of forest establishment and growth.** University of British Columbia, Vancouver, B.C. 1955. pp. 13.

An H. R. MacMillan Lecturership Address, 1955. With particular reference to the establishment of *Pinus radiata* plantations in Australia and New Zealand and the use of fertilizers in plantations.

2679. **Forest management research. Granitic loams.** *Carib. For.* 16 (1/2), 1955 (6–7). (*15th Rep. U.S. Trop. For. Res. Cent. 1954.*)

The object of experiments in this area is to discover trees suitable for field planting, and producing a crop attractive to private landowners. *Casuarina equisetifolia* and *Eucalyptus robusta* grow well, but no market exists for them in large quantities; Mahogany has too long a rotation.

2680. **Forest management research. Deep lateritic clays.** *Carib. For.* 16 (1/2), 1955 (4–6). (*15th Rep. U.S. Trop. For. Res. Cent. 1954.*)

Presents the results of research in the reforestation of bare lands and the improvement of existing forests. Experiments were made in propagating *Cecropia peltata*. Sowing in the nursery at sea level (below the natural range of the species) produced no germination in the sunlight; but in half-shade two samples gave 2% and 9% germination respectively. The seedlings were 10 in. high after 6 months and were transplanted with bare roots without loss. Direct-sown Mahogany [cf. *For. Abstr.* 16 (No. 1611)] has continued to develop satisfactorily, but it has proved necessary to pay early attention to release. *Eucalyptus robusta* has continued its rapid development in older plantations to diameters approaching sawlog size. Information is presented on the growth of some *E. robusta* plantations. *Cupressus lusitanica* has made very rapid growth at high altitudes (3500 ft.). At 700 ft., however, trees are branchy and much less vigorous. The root system is limited and a few cases of windthrow have occurred. Data are presented on the development of Broadleaf Mahogany plantations and on increment in natural Tabonuco-type forest [cf. *For. Abstr.* 15 (No. 2752)]. Experiments in improvement fellings in the Luquillo Forest indicate after 2 years that little or no improvement of the natural forest is likely to result from this method. Up to the present *Swietenia macrophylla* is the most promising species for this problem area.

2681. **Forest management research. Humid limestone.** *Carib. For.* 16 (1/2), 1955 (7–9). (*15th Rep. U.S. Trop. For. Res. Cent. 1954.*)

The problem of this region is not one of reforestation, but of the introduction of superior species into existing stands. *Tabebuia donnell-smithii*, used for underplanting a secondary stand, became chlorotic and made very little growth, but responded well to complete removal of shade. *Hieronyma clusioides* underplanted in the Guajataca Forest has made slow but continuous growth beneath light shade [cf. *For. Abstr.* 15 (No. 2494)]. *Cupressus lusitanica*, when underplanted at low altitudes in Rio Abajo forest, seemed at first doomed to complete failure, but when completely liberated from shade, rivalled in growth-rate plantations made at higher levels. Plantations of *Swietenia mahagoni* have made fairly satisfactory growth. Light shade is valuable in inducing good form in this species as well as in *Bucida buceras*. *Hieronyma clusioides* in plantations has proved a tree of good form but moderate growth rate. *Bambusa tulda* underplanted 7 years ago on a lower slope in the Cambalache forest now has good prospects of eventually dominating the natural vegetation in this plantation. Teak is adapted to the sink holes between the limestone hills in this area. A heavy thinning in a rapid-growing *Swietenia macrophylla* plantation showed that such stands can close the openings created before climbers become a problem. This is the valuable species best adapted for planting in this area.

2682. **Forest management research. Humid tuffaceous loams.** *Carib. For.* 16 (1/2), 1955 (3–4). (*15th Rep. U.S. Trop. For. Res. Cent. 1954.*)

Reports on the development of plantations on this type of site. A 16-year-old Teak plantation in the Luquillo Forest on the exposed slope has attained a b.a. of more than 100 sq. ft./acre, but the form of the trees is not as good as on deeper soils [cf. *For. Abstr.* 15 (No. 2413)]. Mahogany planted under a nurse crop of Casuarina on a stony ridge has produced after 5 years trees averaging 10 ft. in height [cf. *For. Abstr.* 16 (No. 1610]. Field plantations of *Hernandia sonora* on a lower slope at St. Just have produced trees of good growth and excellent form [cf. *For. Abstr.* 15 (No. 2412)]. Two of the more insect-resistant species of Bamboo (*Bambusa tuldoides* and *B. longispiculata*) have proved adapted to this site at St. Just, although their growth is inferior to that on deeper soils [cf. *For. Abstr.* 15 (No. 2547)].

2683. Carvalho, J. Silva. A *Cupressus lusitanica* em São Paulo. [***C. lusitanica* in São Paulo.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (124–42). 5 refs. [Port.e.]

According to observations and measurements made in a 17½-year-old stand at the State Forest Nursery of Tremembé, *C. lusitanica* finds optimum conditions for growth in São Paulo. Grown on a rotation of 20–30 years, its yield is not less than 20 cu.m./ha./year. Since it is a light-demanding species, spacing at 20 years must be increased to ca. 3 × 3·5 m.

2684. Bastos, A. de Miranda. O charão no Brasil. [**The lacquer tree in Brazil.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (231–8). [Port.e.]

Short notes on the industry and the uses of the lacquer in China and Japan, and the introduction of the tree into Brazil in 1930. *Rhus vernicifera* did not succeed, but *R. succedanea* throve well, and stands now exist in various parts of São Paulo. Methods of tapping and the future of the industry in Brazil are briefly discussed.

2685. Soekarpi. Beberapa tjatatan tentang *Acacia auriculiformis* A. Cunn. [**Some notes on *A. auriculiformis*.**] *Rapp. Bosbouwproefsta., Bogor* No. 71, 1955. pp. 11. 8 refs. [Jav.e.]

Investigations were made on the suitability of *A. auriculiformis* for afforesting deteriorated or infertile soils. On a brownish-red poor lateritic soil near Bogor the main crop showed, at 9 years, upper heights of 20·6 m. in an unthinned block, and 18·8 and 18·9 m. in two thinned blocks. Mean heights were 17·0, 17·4 and 17·7 m., and mean diameters 14·2, 18·5 and 19·8 cm. Mean heights for thinnings from the two blocks were 18·3 and 17·9 m., and mean diameters 14·7 and 14·4 cm. Figures of growth data are given in a table with English legends. The wood is suitable only for fuel because of poor stem form. Tentative conclusions on regeneration from coppice are that: (1) shaded stumps sprout better than unshaded ones, and stumps should be tall enough to prevent complete drying out before the buds sprout; (2) stumps with one branch left intact sprout well. Further investigations on sprouting and regeneration are needed.

2686. Ardikoesoema, R. I., and Noerkamal, M. T. Pertjobaan tanaman *Shorea leprosula* di Djawa. [**A plantation of *S. leprosula* in Java.**] *Rimba Indonesia* 4 (6/8), 1955 (299–337). 33 refs. [Jav.e.]

Two-month-old seedlings were planted under 2-year *Albizzia falcata* at Haurbentes, 60 km. northwest of Bogor, on a hilly site with permeable soil, poor in minerals. Average annual rainfall is 3628 mm. with no pronounced dry season. Seeds were collected in E. Sumatra; germination % was high (80%) but decreased after a month. Vegetative propagation, yielding 45% successful stem cuttings, can also be used. After 13 years, including a very dry period, the trees flowered and gave a good seed crop. Fallen seeds germinated on the forest floor and 276–547 plants/ha. were counted. At 15 years, the stand has passed the pole stage and is healthy; there is no shot- or pin-hole damage. The wood is light in weight, floats when freshly felled, is in class III for both durability and strength, is easily worked, shrinks only slightly, and can be used as veneer and for constructional uses under cover. It is in great demand at the Bangka tin works. Increment figures [tabulated] are higher than those reported for natural regeneration in Malaya and for dryland forests of E. Sumatra. *From authors' summary.*

232.12. Races and Provenance Trials

See also Nos. 2585, 2911, 2980, 2982.

2687. Åkebrand, V. Mall för proveniensval. [**Pattern for choosing provenances.**] *Skogen* 43 (4), 1956 (78–9, 90). [Sw.]

Discusses difficulties in following Langlet's recommendation that seed for a given regeneration area should be collected from distances of up to 20 [Swedish] miles [ca. 60 English miles] N. or S., the distance varying with differences in altitude between the regeneration and the provenance zones; the chief difficulty is caused by the practice of describing provenances by latitude (a complete degree) and altitude (in 100 m.). Provides a table, and a template marked off in rectangles to fit over the table and showing for Norway, Sweden and Finland, for a given regeneration zone, the 9 provenance zones (e.g. for regeneration zone 61°/300 m. the provenance zones will be 60/200, 300 and 400, 61/200, 300 and 400 and 62/200, 300 and 400) from which seed can be drawn, with the order of preference, and similarly for a given provenance zone the 9 regeneration zones in which the seed can be used.

2688. Løfting, E. C. L. Danmarks ædelgranproblem. 1. del. Proveniensvalg. [**The problem of *Abies alba* in Denmark. Part 1. Choice of provenance.**] *Forstl. Forsøgsv. Danm.* 21 (4), 1954 (337–81). 20 refs. [Dan.e.]

Abies alba, used in the heath and dune plantations in Denmark, is near its climatic limit and is particularly sensitive to slight variations in available moisture. Studies on 20 European provenances

have been made at a number of different localities in Denmark. Material from relatively high mountain regions seemed to be of slightly slower growth; that from Gurre Vang (Denmark) and Lapos (Rumania, 700 m.) had reached a slightly greater mean height, but was a year older than much of the material examined. Central European and Danish material appeared to be most, and that of S. and E. European provenance least, susceptible to attack by *Chermes* spp. Provenances from Lapos, Perister Planina (S. Serbia 1550 m.), Como (1500 m.) and to a lesser extent Gariglione (Calabria 1600 m.) and the Pyrenees (locality not specified) appear to be resistant normally, but they may be attacked in unfavourable conditions, e.g. when severely damaged by frost. Graphs of height and height increment for the Gurre Vang and Lapos provenances at Bidstrup and Bregentved 1949–53 illustrate the effect of attack by *Chermes* on the Gurre Vang provenance at Bidstrup. There appeared to be little difference between flushing dates for the different provenances, but shoot growth of the S. Serbian and Rumanian provenances continued later than that of the Mediterranean provenances. The difference is explained by differences in climate in the regions of origin and suggests that the Mediterranean provenances may be less suited to conditions in Denmark, where drought conditions tend to occur early in the growing season. The northern limit of the species in Poland is suggested as another region from which provenance trials might be made in Denmark. The investigations included a provenance of *A. nordmanniana*, 5–10% of the plants being apparently hybrids with *A. alba*. Pure *A. nordmanniana* appeared to be resistant to *Chermes* but the hybrids were attacked.

2689. Lindquist, B. **Provenances and type variation in natural stands of Japanese Larch.** *Meddelanden från Göteborgs Botaniska Trädgård* (*Acta Horti Gotoburgensis*), *Göteborg* 20 (1), 1955. pp. 34. 41 refs. [E.] Price *Kr.*8.

Discusses natural distribution and habitats of *L. leptolepis* in Japan, and field studies and provenance trials on morphological variation in stem and crown type. These show that provenances from higher altitudes have far better stem types but show wide variation in crown and branch type, with a higher % of very coarse-branched trees, whereas those from low levels have a poor stem type but more regular crowns and few coarse-branched trees. The best provenances are from medium and high altitudes in Yatsugadake and Fuji. A comparison of climatic data suggests that seed for western Europe should be collected from high altitudes (1400–2000 m.) and from areas most closely approaching continental types of climate (Nagano, Guma and Tochigi).

2690. Brandt, K. Proveniensforsøg med skovfyr m.v. i Jørgensens plantage, Djursland. Afsluttende rapport. **[Provenance trials with Scots Pine and other Pine species in Jørgensens plantation, Djursland. Final report.]** *Forstl. Forsøgsv. Danm.* 21 (4), 1954 (448–58). [Dan.e.]

The trials were established in 1913–17 and examined in 1925, 1947 and 1953 [cf. *For. Abstr.* 13 (No. 3747)]. In 1925 most of the Scots Pine provenances showed good growth, those from Skramsø (original provenance unknown), Scotland and the Baltic being best. By 1947 the Finnish provenance had taken the lead, the others, especially the Campine, Baltic, Scottish and Skramsø provenances having been attacked by *Fomes annosus* and *Myelophilus piniperda*. By 1953 the west-Norwegian and Finnish provenances were also suffering from attack by *F. annosus* and *M. piniperda*, whereas the Baltic and Campine provenances were relatively in better condition. It is suggested that the time of thinning and physiological age may have influenced the course of the attacks in the different provenances and that the drought in 1947 may have promoted the heavy attacks in the Finnish and W. Norwegian plots. Of the other species, only *Pinus contorta* var. *latifolia* and *P. nigra* var. *austriaca* survived by 1953. None of the species or provenances tested has developed satisfactorily and it is impossible to tell whether any might be more resistant to attack by *F. annosus* and *M. piniperda* than the rest.

2691. Dengler, A. Wachstum türkischer und deutscher Kiefern im Versuchsgarten Eberswalde. **[The growth of *Pinus sylvestris* from Turkey and Germany compared at Eberswalde.]** *Arch. Forstw.* 4 (1), 1955 (8–10). 3 refs.

The height growth of the Turkish race compared with that of Pine from the north-east German plain at 13 years was as 50 : 100 and the mortality (chiefly from *Lophodermium pinastri*) was respectively 45·4 and 9·3%.

2692. Lotti, T. **Yellow-Poplar height growth affected by seed source.** *Tree Plant. Notes* No. 22, 1955 (3).

A small provenance trial near Charleston, S. Carolina, showed that at 3 years old, trees from a mountain seed source (western N. Carolina) averaged 4·4 ft. and those from coastal-plain seed (eastern N. Carolina) averaged 7·9 ft.

232.2. Preparatory Work, Auxiliary Measures

See also Nos. 2658, 2747, 2755, 2765, 2777, 2837, 2839–40, 2942–3.

2693. Reinecke, G. Erfahrungen mit dem Einsatz von Fräsen bei den Kulturarbeiten im Regierungsbezirk Lüneburg. **[Experience with rotary cultivators in plantation work in Lüneburg district.]** *Forst- u. Holzw.* 10 (7; 8), 1955 (129–41; 159–62). [G.]

Describes experiences with 3 German makes of cultivator, all two-wheel, Diesel-powered, and fitted with sets of knives on disks having working widths of 60–90 cm., for the preparation of sites and for work between rows in plantations. For the preparation of sites covered with dense *Vaccinium*-type vegetation, the soil should be worked first in winter or late spring, again in summer, and a third time in autumn. For grassy sites, cultivation is most effective in a light frost. Economies compared with work by hand are considerable.

2694. Liebeneiner, E. Vollumbruch auf nicht gerodeten Flächen. **[Complete cultivation without**

stump clearing.] *Forst- u. Holzw.* 10 (9), 1955 (180–3). 1 ref. [G.g.]

Describes the method and the equipment used on sandy sites previously stocked with Pine. The equipment consisted of a 50-h.p. Deutz wheeled tractor, a shallow disk plough, a harrow with spring tines, and a heavy plough with a lifting mechanism. Surface vegetation was removed and the mineral soil mixed with the humus throughout the area. Deep ploughing covered 50 to 90%. Tractor times, ca. 25 hours/ha., are 10 to 20% more than on stump-cleared land. Planting was equally successful.

2695. HARTIG, R. Unsere Erfahrungen bei der Gerätekopplung in der Forstwirtschaft. [**Experience with coupled equipment in forestry.**] *Wald* 3 (1), 1953 (29). [G.]

Describes the combined use of a coulter planting machine and a 'Waldmeister' plough drawn by a single tractor, in afforestation work on sandy waste lands and clear fellings, and the parallel coupling of 2 'Waldmeister' ploughs behind one tractor.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

See also Nos. 2565 *et seq.*

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also No. 2698.

2696. MESSER, H. Untersuchungen über das Fruchten der Weymouthskiefer (*Pinus strobus* L.) und der grünen Douglasie (*Pseudotsuga taxifolia* var. *viridis*). [**Fruiting of *P. strobus* and *P. taxifolia* var. *viridis*.**] *Z. Forstgenet.* 5 (2), 1956 (33–40). 6 refs. [G.e.f.]

Studies were made in the municipal forest of Frankfurt-am-Main and in the Wolfgang forest district, to investigate: (1) cone production of different Kraft crown classes, (2) seed yield of cones, (3) seed-ripening season, (4) time of harvesting and seed extraction, and (5) frequency of seed years. (1) It was established that the number of cones produced by trees of crown class I averaged twice that of crown class II. Of all cones collected, 95% come from trees of crown classes I–III. In a 90-year stand of *P. strobus*, the total number of cones was 5 times that in a comparable 60-year stand. (2) In the 90-year *P. strobus* 72·63 kg./ha. of seed were collected, a yield comparing favourably with that of Spruce and Larch. (3) *P. strobus* seed ripens in mid-August some days before that of the Douglas Fir. (4) Because of the high moisture content of the cones, it is inadvisable to harvest cones of either species too early. The m.c. falls in 4 weeks to 20% of the fresh weight, and at ca. 20–25% *P. strobus* seems to shed its seed. (5) Seed years occur in *P. strobus* so frequently that it should be possible to provide enough seed for home use from approved stands. Green Douglas Fir, however, has too few seed years for this to be possible.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 2702, 2715, 2868.

2697. CARMICHAEL, A. J. **A net for the collection of winged hardwood fruits.** *Tree Plant. Notes* No. 22, 1955 (4–5).

Describes the erection of nets, down-wind from trees of Elm, Maple, Ash etc., to stop the fruit in flight, allowing them to fall to the ground and be collected. Quantities and costs of materials are given.

232.314. Seed Purchase, Trade and Transport

2698. STERN, K. Rassenbildung und Bestandesanerkennung. [**The formation of races and the approval of forest stands.**] *Z. Forstgenet.* 5 (1), 1956 (5–14). Many refs. [G.g.e.f.]

Discusses the law governing the control of forest seed provenance (*Saatgutgesetzgebung*) in the German Federal Republic, the interpretation of the term 'race', and the main causes of race formation, and concludes that the existing law basing provenances on climatic zones, and certifying stands that represent the most suitable local race from the economic standpoint is fully justified by the scientific facts. *From author's summary.*

232.315. Seed Storage and Treatment

See also Nos. 2579, 2710–1, 2720, 2726–9.

2699. REGEL, F. Bekämpfung der Douglasienschlupfwespe *Megastigmus spermotrophus* durch Behandlung des Samens unter besonderer Berücksichtigung von Ultraschall. [**Control of *M. spermotrophus* by seed treatment, particularly with ultrasonic waves.**] *Abstr. of thesis*, in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 1, 1954 (18–22). [G.]

Seeds of Douglas Fir, infested with larvae of *M. spermotrophus*, were subjected to (*a*) varying degrees and periods of heat, (*b*) poisons in solid and gaseous forms, and (*c*) ultrasonic waves. Treatment at 55° C. for 8 hours was successful, while most other heat treatments, and treatments with CS_2 were either insufficiently lethal to the larvae or injurious to the seed. HCN, though effective, is unsuitable for large-scale application because of its high toxicity to humans. As ultrasonic waves travel only in liquids, the seeds for (*c*), were soaked for 24 hours either immediately before, or 7 days before, exposure, the latter in order to test the effect on seeds in which germination activities had been initiated. The larvae were subjected to the waves either inside the (soaked) seeds or exposed. Those exposed died after 5 minutes at 40 W, whereas the others were still alive after 8 hours' treatment, presumably through being protected by a reflecting layer of air inside the kernel which remained impermeable to water even after soaking and moist storing. The method is therefore unsuitable for the control of the pest. It was noted that the germination % of the seeds was not affected by exposures up to 70 W intensity and lasting < 1 hour, but longer exposures at 40 W progressively reduced it, particularly for the 'pre-germinated' seeds. The

germination activity of these latter was temporarily stimulated by short exposures (5 minutes) at 40 W. No effect on 1-year seedlings grown from treated seeds was observed. The original paper carries tables and a bibliography.

2700. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.). II. The preservation of Rangusu (*Cinnamomum camphora* var. *nominale* Hay) seeds.]** *Bull. Tokyo Univ. For.* No. 48, 1955 (91–5). 10 refs. [Jap.jap.e.]

Germination tests require 80–90 days. Seeds were put in glass jars, over $CaCl_2$, in sand and in wood ash, and stored in a refrigerator, cellar, dark room and laboratory. Low temperatures and both dry and moist air reduced germination. The germinative capacity of seeds kept in soil for 9 months under natural conditions through the winter was practically unaffected.

2701. NYHOLM, I. Opbevaring af bøgeolden. **[Storing Beech mast.]** *Dansk Skovforen. Tidsskr.* 39 (3), 1954 (153–9). [Dan.]

The following conclusions were drawn from a series of experiments: (1) Germination and keeping qualities depend on moisture content (m.c.) of the seed. (2) Seed should be kept in the cool, at $\geq 5°$ C., and sown as early as possible in spring. (3) Between autumn and sowing, m.c. should be $\leq$ 17–18%, and if it falls lower should be raised by soaking or stratification before sowing. (4) Storage over a longer period is possible if m.c. is reduced fairly quickly, preferably in a week or less, to $< 16\%$ if seed is to be stored at 1–5° or $< 11\%$ if it is to be kept at minus temperatures. Fresh seed can be dried at temperatures of 20–25° before storage, but any kept through the winter at 18% m.c. must be dried carefully at a lower temperature, e.g. 10°.

2702. BARNER, H., and DALSKOV, F. Erfaringer med opbevaring af Douglasfrø. **[Storing Douglas Fir seed.]** *Dansk Skovforen. Tidsskr.* 39 (10), 1954 (570–5). [Dan.]

Douglas seed, de-winged either in a machine with rotating brushes or by hand, and dried to about 7% moisture content, was stored for up to 4 years at 4° or at 8–15° C. The seed de-winged by hand and stored at 4° showed no reduction in germination over the 4 years, while that stored at 8–15° showed slight but significant reduction. That de-winged by machine showed a slight, possibly significant, reduction at 4°, and a considerable reduction at 8–15°.

2703. SCHUBERT, G. H. **Effect of storage temperatures on viability of Sugar, Jeffrey and Ponderosa Pine seed.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 100, 1955. pp. 3. 1 ref.

Germination of seeds stored for 2 years in ½-gallon tins with tight lids at 0°, 23°, 32° and 41° F. was compared with that of fresh seed. Best results were obtained for Sugar Pine at 0° F. (94% germination), for Jeffrey Pine at 23° (93%), and for Ponderosa Pine at 32° (85%); germination of fresh seed was 98, 93 and 86% respectively. Sugar Pine seed stored at 41° lost all viability but for the other two species the difference between the best germination and that at 41° was only 9%. Samples of the stored seed were also stratified for 5 months at 36° before sowing; this proved too long, 90% of the viable Sugar Pine and 24% of the Jeffrey Pine seed germinating during stratification. A separate test suggested that Sugar Pine stored at 0° may require only one month's stratification instead of the usual 3-month period. Tests on the same seed lots will be made after 5 and 10 years of storage.

2704. MACGILLIVRAY, H. G. **Germination of Spruce and Fir seed following different stratification periods.** *For. Chron.* 31 (4), 1955 (365).

Germination tests were made of *Picea glauca*, *P. rubens*, *P. mariana* and *Abies balsamea* seed that had been stratified for 3, 14 or 27 months in moist sand at temperatures of 32–36° F. The difference in germination between seed stratified for 3 and for 14 months was not great except in the case of *P. mariana* (76% and 50%). Germination % of seed stratified for 27 months was 0 for *P. glauca*, 10 for *P. rubens*, 11 for *P. mariana* and 0·5 for *A. balsamea*.

2705. TRIBUNSKAJA, A. JA. Posev semjan sosny v organo-mineraljnyh granulah. **[Sowing Pine seeds pelleted with a mixture of organic and mineral matter.]** *Agrobiologija* 1955 (2), (139). [Russ.] I.M.I.

On grey forest clay-loams in the Sverdlovsk region, germination and early growth of Scots Pine were improved by pelleting a mixture of 200 g. each of sifted compost, 'mycorrhizal soil' or decayed humus, superphosphate, clayey soil, and Pine seed, with the addition of 10 g. chalk and 350–400 ml. water. The pellets, about the size of a pea, contained 5–8 seeds each. Germination was more uniform, the roots had better developed mycorrhizae, and the plants were 25–30% taller than controls in the autumn of the first year. Some experiments were also made [no details given] on the effect of steeping the seed for 18–24 hours in various substances. Seedling growth was stimulated by steeping seed in 10 or 20% malt suspensions, and results were especially good if, in addition, the sowings were treated with 5–10 g. superphosphate per spot or per linear metre of drill.

2706. SZWED, J. O przedsiewnym moczeniu nasion modrzewia. **[Soaking Larch seeds before sowing.]** *Las polski* [*Warszawa*] 29 (5), 1955 (28–9). [Pol.] From *abstr.* in *Prehl. lesn. Lit.* 6 (10), 1955 (No. 3879). [Cz.] P.R.

Recommends soaking seeds of *Larix* sp. for 24 hours, and discarding the floating ones. Beds should be covered with moss or branches, and well watered.

2707. YASUDA, I. **[Germination tests on some flower seeds.]** *Scientific Reports of the Faculty of Agriculture, Okayama* No. 7, 1955 (31–5). 4 refs. [Jap.jap.e.]

Includes results for seeds of *Mimosa* sp. and *Acacia dealbata*. For both, germination % was low by ordinary methods, but high when the seed tip was cut or injured. Soaking *Mimosa* seeds in H_2SO_4 or NaOH for ½ hour improved germination. *From author's summary.*

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 2579, 2700.

2708. MÜLLER-OLSEN, C., SIMAK, M., and GUSTAFSSON, Å. **Germination analyses by the X-ray method: *Picea abies* (L.) Karst.** *Medd. SkogsforsknInst., Stockh.* 46 (1), 1956. pp. 12. 12 refs. [E.sw.] Price *Kr.*1.

A close correlation was found between seed quality determined by X-ray and germination in a Jacobsen germinator [cf. *For. Abstr.* 15 (No. 3476)]. The method was successfully used on 90 samples of seed from all parts of Sweden.

2709. VAZ, A. L. CASTELÃO. A análise de sementes do género *Cupressus*. **[Testing *Cupressus* seed.]** *Estud. Inform. Serv. flor. aqüíc. Portugal* No. 54–*F*3, 1955. pp. 35 + 1 gph. 7 refs. [Port.] Limited distribution.

Tests with seed of *Cupressus* spp. showed that a high % of sterile seed is to be expected within a sample, but that the sterile seed can be largely eliminated by sieving. A simple formula is presented whereby seed viability can be estimated from a simple cutting test.

2710. LAVENDER, D. P. **Western Hemlock seed germination after exposure to varying temperatures and humidities.** *Res. Note Ore. Bd. For.* No. 26, 1956. pp. 4.

A study was made of the effect of various temperatures and relative humidities, after removal from cold storage, on germinative capacity of *Tsuga heterophylla*. It is concluded that conditions capable of significantly reducing germinative capacity do not occur during normal handling of seed. [Cf. *For. Abstr.* 17 (No. 334).]

2711. SCHUBERT, J. Zur Prüfung hartschaligen Saatgutes von *Robinia pseudoacacia* L. **[Testing hardcoated *Robinia* seed.]** *Arch. Forstw.* 4 (2/3), 1955 (241–69). 27 refs. [G.g.] [Forstbotanisches Institut, Tharandt.]

Seven batches of *Robinia pseudoacacia* seed, one of var. *semperflorens*, and one of *Laburnum anagyroides*, were tested under comparable conditions in a Jacobsen germination tester and in the field. The treatments given and the conclusions drawn were as follows:—(*a*) No treatment: germination in 126 days varied from 4 to 91 %, the number of 'fresh' seed left being 94–6% (these latter figures indicate the range of the hard coat condition); (*b*) soaking one hour in water at 60° C.; (*c*) soaking in conc. H_2SO_4, 100 and 120 min. (times chosen after preliminary trial); both (*b*) and (*c*) are unsuitable for testing because some seeds are damaged and the coats of others remain 'hard'); (*d*) filing to expose 1 sq. mm. near the cotyledon tip ('hardness' was eliminated in all cases but the method used, which is laborious but capable of improvement, damaged some seed); (*e*) exposing 1 sq. mm. as in (*d*) but by clipping with scissors (this treatment meets all the demands of exact testing and makes the evaluation of the real seed-quality possible). These conclusions are supported by graphs and histograms showing the cumulative germination % against plant %, the % of seed germinated at 7, 14 and 126 days, and of 'fresh', decayed and abnormal seed remaining, under each treatment. In place of the present international 42-day test [cf. *For. Abstr.* 15 (No. 2444)] the following is proposed: soak 3 lots of 100 untreated seed for 10 days in water and determine the % of swelled seed; clip the seed as in (*e*) and subject them to alternating temperatures (8 hours, including heating up, at a water temperature of 30° C. and 16 hours at 20°) in a Jacobsen tester and then in an incubator at 25°. Determine germinative energy and capacity at 7 and 14 days respectively from the day of setting in the tester. [Cf. *For. Abstr.* 4 (pp. 26, 102).]

2712. BOUHARMONT, J. Recherches sur les parasoliers congolais (*Musanga cecropioides* R. Br. et *Cecropia leucocoma* Miq. I. Les conditions favorables à la germination. **[Studies of the Umbrella trees of the Congo. (*M. smithii* and *C. leucocoma*). I. Conditions favouring germination.]** *Agricultura, Louvain* (*Ser. 2*) 2 (2), 1954 (83–107). 3 refs. [F.f.flem.] H.S.B.

To elucidate difficulties in obtaining germination in the laboratory in earlier tests [cf. *For. Abstr.* 12 (No. 289)] *Musanga* seeds of varying ages were placed in Petri dishes—mostly on moist blotting paper—variously treated, e.g. mixed with charcoal, soaked in water, acetic acid or HCl, or taken from a pheasant's stomach, and subjected to varying degrees of temperature, moisture, and light. Temperature emerged as the most important factor. A temperature of 30° C., preceded by a period of temperature variations, resulted in germination %s of over 80, whether with other treatments or without. Moisture was important, but temporary desiccation not harmful. In contrast to the earlier experiments mentioned, results of mixing with charcoal were contradictory. *Cecropia* seeds presented few difficulties.

2713. SOUZA, P. F. Porcentagem germinativa de sementes. Resultado de 548 ensaios com espécies indigenas ou exoticas. **[Germination percent of seeds. Results of 548 tests with native and exotic species.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (79–91). [Port.e.]

The results are listed of tests made between 1933 and 1941, mainly with native species.

232.32. Plant Rearing. Nursery Practice

See also No. 2765.

2714. MULLIN, R. E., MORRISON, L. M., and SCHWEITZER, T. T. **Inventory of nursery stock.** *Res. Rep. Ont. Dep. Lds. For.* No. 33, 1955. pp. 64.

A study of sampling methods for use in making inventories of nursery stock. Data, analyses, and recommendations are dealt with separately for different nursery categories, e.g. seedbeds, flats, transplant rows etc.

2715. MORRISON, F. T. **Nursery propagation of Kauri [*Agathis australis*] at Waipoua Forest.** *N.Z. J. For.* 7 (2), 1955 (42–52).

Techniques in the handling of Kauri, as developed or in course of development at the Waipoua Forest

Nursery, are described under the following heads: seed collection and seed trees, seedbed preparation and sowing, cultivation and weeding, nursery injuries and their control, lining out, preparation of trees for planting, nursery trials and experiments. It is considered that successful techniques have been evolved, though there is still room for improvement, particularly in relation to the hardening off of stock prior to planting. A trial of the Dunemann system [of nursery seedbeds—see *For. Abstr.* 14 (No. 1151)] has shown particular promise. *Author's summary.*

2716. **[Nursery and plantation technique for *Pinus caribaea* in Trinidad.]** *Rep. For. Dep. Trin. Tob. 1954*, 1955 (22).

In the nursery, transplants are spaced 3 × 3 ft. and the tap roots cut by means of a taut piano wire drawn beneath the bed. This technique has produced plants with better root systems at a lower price. Yellowing of transplants is corrected by applying 2 oz. urea in 2 gal. water/sq. yd. Small Pine plantations were made at 6 centres in different parts of the country and all were given a dressing of superphosphate at ca. 2 oz./plant. Even on the worst sites, on acid gravel beds, very few of the Pine turned yellow. *P. merkusii* continues to grow more slowly than *P. caribaea* and there appears to be no reason for preferring it.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 2721, 2734–6, 3472.

2717. EVANS, E. **Survival and recolonization by fungi in soil treated with formalin or carbon disulphide.** *Trans. Brit. mycol. Soc.* 38 (4), 1955 (335–46). 11 refs.

In samples of soil taken 3 weeks after treatment with dilute formalin, *Trichoderma viride* had established itself as the dominant fungus, and this dominance persisted throughout 6 months of sampling. On agar, *T. viride* was more tolerant of formalin than were 7 other common soil fungi. It also became dominant after treatment of soil with CS_2 at a rate of 0·5 ml./250 g. moist soil. After higher dosage (1 to 10 ml. CS_2), the dominant fungi were two ascomycetes, *Penicillium luteum* and *Aspergillus fischerii*, which were found to be highly tolerant of CS_2 *in vitro*, by comparison with other fungi tested. Soil sterilized by intermittent steaming was reinoculated by means of unsterilized soil and the process of recolonization followed. In closely packed soil, the first fungal colonizers were fast-growing Phycomycetes, but in loosely packed soil their place was usually taken by *T. viride*. [Cf. *For. Abstr.* 15 (No. 1286); 16 (No. 1653).] *From author's summary.*

2718. MITSCHERLICH, E. A. Düngung im Saatkamp. **[[Inorganic] fertilizers in the nursery.]** *Arch. Forstw.* 4 (4), 1955 (302–8). [G.] [Institut zur Steigerung der Pflanzenerträge in Paulinenaue.]

Discounts the opinion that nursery stock should be raised in a soil not superior to that in which it will be finally planted; shows the results of growing Scots Pine, Spruce, Beech and Oak seedlings, watered with 3 concentrations and 2 ratios of N, P, and K, in pots of sterile sand, and makes recommendations for the watering in of such solutions on a nursery scale, based on nursery trials indicating greatly stimulated root and shoot growth, with the saving of a whole growing season or more if the treatment is continued. Uniform fertilizer treatment also allows of the easier selection of inherently good stock by plant breeders. The treatment for both Spruce and Pine is to water at 5 litres/sq. m. 3 times weekly (except on rainy days) with a 0·75-parts-per-1000 solution of equal parts by weight of N, P and K (the make-up of which is detailed) from May/June to mid-July, when the strength is doubled. Applications cease in October to allow seedlings to harden off.

2719. **Wonsover land preparer and planter.** *For. Equipm. Note FAO* No. *B.* 7.55, 1955. pp. 2.

Describes and gives specifications of a machine manufactured by the Norton Portland Corporation, Portland, Maine. The machine, operated by one man, in a single operation mixes and prepares the soil to a depth of 10 in., incorporates weedkiller, insecticide, fungicide, lime and fertilizer into the soil, sows the seed, and compacts the soil.

232.323. Sowing and Covering

See also Nos. 2680, 2706, 2719.

2720. TAKATOI, I. **[On the sowing-time of the Larch-seeds at nursery.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 80, 1955 (101–17). [Jap.jap.e.] (Also in *Rep. For. Exp. Sta., Hokkaido* No. 6, 1955 (101–17).)

Reports the effects of 'stimulating in sand' for 10 days and stimulating by cold for 2 months, on the germination period after various sowing dates (24 April–8 June), germinative capacity, height growth, and number of suitable transplants in the following autumn.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 2718, 2736.

2721. **Hoop Pine [nursery practice].** *Rep. Dir. For. Qd. 1954/55*, 1955 (10).

Indications are that pre-sowing applications of cow manure at 10–20 tons/acre at two-year intervals will maintain Hoop Pine [*Araucaria cunninghamii*] nursery fertility. Use of white spirits as a pre-emergence weedkiller has greatly reduced weeding costs and is now routine. Interesting results were obtained from the use of Crag Herbicide No. 1 as a post-emergence weedkiller. This material, based on 2,4-D ethyl sulphate [cf. *For. Abstr.* 14 (Nos. 292–3)] shows no herbicidal properties until broken down by soil micro-organisms to 2,4-D, when it becomes toxic to germinating weeds. At Yarraman it greatly reduced weed development and prevented a heavy development of *Erigeron* on treated plots.

2722. CIFERRI, R. Il 2,4-DS. **[2,4-DS.]** *Notiz. Malatt. Piante* No. 28, 1954 (74–6). [It.] I.M.I.

An account of the properties and behaviour of the Na salt of 2,4-dichlorophenoxyethyl sulphate (2,4-DS) with particular reference to its lack of toxicity before it has been subjected to soil biological activity. It has been used successfully in Italy in conifer nurseries as well as on horticultural crops.

2723. JACKS, G. V., BRIND, W. D., and SMITH, R. **Mulching: Part 1. The effects of mulching on soil properties. Part 2. Mechanized stubble-mulch farming.** *Tech. Commun. Bur. Soil Sci., Harpenden* No. 49, 1955. pp. 87 + 17 photos. 273 refs.

Part 1 contains sections on soil moisture, soil temperature, organic-matter content and soil flora and fauna, chemical effects, and soil structure.

232.327. Protection Measures in Nurseries

See also Nos. 2547, 3071.

2724. Tratamientos contra plagas diversos en los viveros. **[Control measures against various nursery pests.]** *Montes, Madrid* 11 (66), 1955 (479–82). [Span.]

A series of brief reports on different undertakings by the Nursery Section of the Spanish Forest Pest Control Service.

2725. VAARTAJA, O. **Notes on damping-off in the Prairie nurseries.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (2–3).

A high incidence of damping-off was apparently encouraged by the occurrence of unusually rainy weather while burlap covers were still on the seed-beds.

2726. VAARTAJA, O., and WILNER, J. **Field tests with fungicides to control damping-off of Scots Pine.** *Canad. J. agric. Sci.* 36 (1), 1956 (14–8). 12 refs. [Forest Nursery Station, Indian Head, Sask.] O.R.E.

Soil treatments with (*a*) formaldehyde, (*b*) acetic acid, (*c*) H_2SO_4, and (*d*) combined soil and seed treatment with Kolodust (sulphur and dichlone) failed to give consistent control against damping-off of Scots Pine in trials in 1951–3. Pelleting the seed with methyl cellulose and Dithane Z-78 (zineb), Orthocide [75% captan], or Tersan (thiram) was tried in 1954 and gave good control. A combined treatment of seed pelleting and repeated soil applications with Tersan gave effective control early in the season, but considerable seedling mortality occurred later. Pelleting with Dithane 14 (nabam) and Vancide 51 (sodium dimethyl dithiocarbamate and sodium 2-mercaptobenzothiozate) was ineffective or toxic. *From authors' summary.*

2727. HOLTZMANN, O. V. **Organisms causing damping-off of coniferous seedlings and their control.** *Abstr. of thesis,* in *Dissert. Abstr.* 15 (12), 1955 (2392). [State College of Washington.] O.R.S.

Extensive isolations from Ponderosa Pine, Norway Spruce and other conifers indicated that *Fusarium oxysporum* is the most important fungal pathogen of conifers in the Matilda F. Gannon Forest Nursery, Pullman, Washington, especially during post-emergence damping-off. *Pythium debaryanum* proved more important than *Fusarium* spp. in pre-emergence, but it, *Rhizoctonia* sp. and other fungi were relatively unimportant in post-emergence damping-off. Damping-off of Ponderosa Pine and Norway Spruce appeared to be influenced by soil temperature, and was greatest at 3 weeks after 30% emergence. The increase and decrease of damping-off associated with *Fusarium* spp. is inversely proportional to damping-off from abiotic causes. *F. oxysporum, F. roseum* and *P. debaryanum* were isolated from many damped-off seedlings of *Thuja occidentalis* and *T. orientalis* in spite of their reported resistance to damping-off. Of 25 fungicides tested, thiram successfully controlled damping-off caused by *Rhizoctonia* sp. and *P. debaryanum.* Seed treatment with NP-1083, Methylendomethylene-Dieldrin Seed Treater, Hexachlorobenzene M-518 JT 866, Panogen, Orthocide RE 2875 45–15 Seed Treater, Puraseed, and chloranil gave promising results, warranting further testing. Panogen should be investigated further as a soil drench. Heavy pelleting of Ponderosa Pine and Norway Spruce seeds with thiram, maneb, captan, Vancide-51 and Stauffer N-24 did not give significant increases in seedling stands, proved toxic to the Spruce, and delayed germination of the Pine. In preliminary trials, pentachloronitrobenzene, used to control weeds and damping-off, slightly stunted both Pine and Spruce seedlings; it should be tested further.

2728. JACKS, H. **Seed disinfection. XII. Glasshouse tests for control of damping-off of *Pinus radiata* seed.** *N.Z. J. Sci. Technol.* 37*A* (5), 1956 (427–31). 3 refs. P.R.

In pathogenicity tests *Pythium* and *Pellicularia* caused damping-off of *P. radiata* seed. Seed dressings did not increase total emergence under the experimental conditions except in soil inoculated with *Pythium* and *Pellicularia.* Seed treatments, although not completely inhibiting post-emergence infection, significantly reduced it. The most successful treatments were those based on organic Mg [compound], captan, and chloranil. *From author's summary.*

2729. SATO, K. **[On the infection by fungi to Sugi [*Cryptomeria japonica*] seeds sown in soil and the effects of seed treatments with organic mercury compounds.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (63–74). 16 refs. [Jap.jap.e.]

Shows in tables with English captions the proportions of seed infected (separately for 6 fungi) when fresh and after dry storage for 2 years, the former producing the greater number and variety of isolates. Soaking seed for 4–5 hours in 0·16% Uspulun solution was fairly effective against these fungi and did not depress germination. *Fusarium* spp., *Cladosporium* sp., *Botrytis cinerea, Alternaria* sp. and bacteria were isolated in Jan.–April from untreated seeds sown in the fall; very effective control was obtained with 4–5% Ceresan and lasted until germination. Seeds sown in spring were attacked more quickly by fungi (*Fusarium* spp., *Rhizoctonia solani, Penicillium* spp., etc.) and organic Hg compounds lost their efficacy sooner; seed treatment with Ceresan, Ruberon dust, and Mercron dust proved very effective, dusts being superior to solutions in preventing pre-emergence damping-off. For seed already infected by soil organisms the fungicides were of little avail.

2730. NOHARA, Y., and ZINNO, Y. **[Researches on the prevention of needle blight of Sugi, *Cryptomeria japonica* D. Don. (III.)]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (31–42). 6 refs. [Jap.jap.e.]

[Cf. *For. Abstr.* 15 (No. 403).] Gives tabulated results, with English titles, of the use of dusts, stickers, and Bordeaux mixture to control *Cercospora cryptomeriae* in the nursery. Basic $CuCO_3$, basic $Cu(ClO_3)_2$ and 'yellow copper oxide [Cu_2O?]' were very effective, as was Bordeaux mixture, but the latter combined with dusting was still more so. Dusting should be done in the rains. All 6 stickers gave good results.

2731. ITO, K., KOTANI, S., and KONDO, H. **[Web-blight fungus of Japanese Larch seedlings.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 79, 1955 (43–70). 18 refs. [Jap.jap.e.]

A study of two strains of *Rhizoctonia* causing web blight in *Larix leptolepis*; of *Rhizoctonia solani* causing damping off in Larch; of *Corticium vagum* causing web blight in leguminous woody plants; and of *C. sasakii* causing sheath spot in rice. It covers the macroscopic characters of the mycelial colonies on agar; the range and optima in temperature for mycelial growth; the effect of pH on growth; reaction to poisons; hyphal fusion and inoculation tests. The authors conclude that the web-blight, damping-off, and sheath-spot types are all referable to *Corticium vagum* which is divided, according to the symptoms produced, into at least these three groups. The web blight is regarded as one of the most important diseases of Japanese Larch.

2732. BATKO, S. ***Meria laricis* on Japanese and Hybrid Larch in Britain.** *Trans. Brit. mycol. Soc.* 39 (1), 1956 (13–6). 5 refs. O.B.D.

M. laricis, well known as a cause of leaf-cast in European Larch, is reported for the first time attacking Japanese and Hybrid Larch nursery stock.

2733. TERASHITA, T., and TAKAI, S. **[Some researches on the diseases of *Eucalyptus* in Japan.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (1–18). 35 refs. [Jap.jap.e.]

Seeds of 14 species of Eucalypt were sown in autoclaved pots with isolates of *Cylindrocladium scoparium*, *Fusarium* sp. and *Rhizoctonia solani*. The last prevented germination in all species; the first was also virulent to all, but *Fusarium* under the experimental conditions (probably too wet for it) was virulent only to *Eucalyptus globulus*. The effect of the fungicides Ceresan and Uspulun was next tested on the germination and root development of *E. globulus* in the absence of these fungi and on mycelial growth of the isolates, in order to determine strengths and duration of soaking harmless to the seed and able to control the fungus. Finally field tests were made in plots inoculated with the fungi, treating the seed and soil both separately and together with these fungicides at the chosen strength. This was, for seed treatment: with Ceresan 8 g. (diluted with talc and kaolin 8 : 1)/kg. of seed; with Uspulun 1/1000, 6 hours' soaking. For soil treatment: 15 kg./acre of the first or 15 kl./acre of 1/1000 for the second. Both seed treatment alone and soil-and-seed treatment are effective against all 3 fungi. Soil treatment alone was not particularly effective against *C. scoparium* and *Fusarium* sp.

2734. ANDERSON, R. L., SKILLING, D. D., and CLIFFORD, E. D. **Nursery root disease control by soil fumigation.** *Tech. Note Lake St. For. Exp. Sta.* No. 449, 1956. pp. 1.

Treatment with MeBr (2 lb./100 sq. ft.) or formaldehyde (1·5 oz./sq. ft.) both gave excellent control of a root disease (cause unidentified) attacking *Pinus strobus*, *Picea glauca* and *P. mariana* in a Michigan nursery. The treatment resulted in heavier seedlings in spite of greater density in the treated seedbeds.

2735. FOSTER, A. A., CAIRNS, E. F., and HOPPER, B. **Modifications in soils of Southern Pine nurseries produced by fungicidal and nematocidal chemicals.** *Abstr.* in *Phytopathology* 46 (1), 1956 (12).

Soil fumigation raised the % of marketable Slash Pine (*P. elliottii*) seedlings, otherwise showing severe root rot, from 35 to 100. MeBr was more effective than $C_2H_4Br_2$ or D-D. Fungicides and nematocides were more effective in combination, though the latter alone reduced the severity of black root symptoms, which are probably due to a fungus/nematode complex. Fumigation did not affect normal mycorrhizal development. [Cf. *For. Abstr.* 17 (No. 1493).]

2736. GUIMARÃES, R. FOOT, KRUG, H. PAULO, and PINHEIRO, J. VIEIRA. Tratamento de sementeiras de eucalipto e seu efeito sôbre o desenvolvimento das mudas. **[Treatment of Eucalypt seedbeds and its effect on seedling development.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (280–7). 1 ref. [Port.e.]

The results are summarized of trials in the raising of Eucalypts by the Companhia Paulista de Estradas de Ferro in collaboration with the State Forest Service. MeBr proved highly efficient in controlling weeds and nematodes in seedbeds, and advanced the seedling growth by at least 15 days.

232.328. Vegetative Propagation

See also Nos. 2452, 2466, 2477, 2483, 2686.

2737. O'ROURKE, F. L. S. **Better trees with the Bolivar pit.** *Trees Mag., Ohio* 16 (1), 1955 (9).

A simple propagating device, known as the Bolivar pit, first used in Ecuador to root Cacao cuttings, may prove of value in rooting cuttings of many trees and shrubs of the temperate zone. The method takes advantage of the insulating power of the earth to prevent fluctuations in temperature and consequent change in humidity. The Bolivar pit consists merely of a hole in the ground containing the rooting medium, a burlap or cloth cover, and a rotary water-sprinkler to keep the cover wet. It is cheap to construct and maintain, and has proved successful in producing rooted cuttings at a low cost. The pit should either be excavated on a well-drained area, or tile drains should be provided. The pit may be made as wide as the sprinkler will disperse water, but 20 ft. square usually suffices. The earth is removed to a depth of 20 in., a layer of gravel 6–8 in. deep is placed in the bottom, followed by a thin layer of sand, and then 6–8 in., of a good rooting medium. Wires are strung across the pit at ground level, and strips of cotton or burlap are stretched on

these so as to overlap. Burlap should be treated with a 1% solution of Cu naphthenate before use. The sprinkler is fastened to a ¾-in. pipe about 3 ft. above the centre of the pit and is controlled by a hand valve. Maintenance consists only in keeping the burlap wet during daylight hours. Usually this can be done by turning on the hand valve for a minute or two every 2–3 hours. After the cuttings begin to root, the amount of water is gradually decreased, with longer intervals between waterings. The cuttings may be hardened off in the pit by gradually parting the burlap strips to let in light and air.

2738. DELISLE, A. L. **The relationship between the age of the tree and the rooting of cuttings in White Pine.** *Abstr.* in *Proc. Indiana Acad. Sci.* 64, 1954 (60–1). A.P.B.

In cuttings taken from one-year-old wood, rooting ability falls off with increasing age of the tree. Experiments were undertaken to test the % of rooting of cuttings taken from one-year-old wood of trees previously grown from cuttings. Cuttings planted in 1938 were allowed to grow into 4-year-old saplings, from which cuttings were taken in 1942. These rooted cuttings were allowed to grow until 1946 into young trees from which cuttings were again taken to test their rooting ability. This process was repeated in 1950, and again in 1954. The results showed a marked decrease in rooting ability with each subsequent replication.

2739. STILINOVIĆ, S. Rezultati uporednih ogleda razmnožavanja amorfe (*Amorpha fruticosa* L.) semenom i reznicama. **[Results of comparative propagation experiments with *A. fruticosa* by seeds and cuttings.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (179–86). 12 refs. [Croat.croat.g.]

Plants obtained from cuttings were found to be better than those grown from seeds (greater number of twigs, greater height).

2740. **Kauri Pine.** *Rep. Dir. For. Qd. 1954/55*, 1955 (9).

Root shoots can easily be obtained when tubed stock of Kauri Pine [*Agathis palmerstoni*] are permitted to root into the nursery bed and the root is severed at lifting. Air-layering of this species has so far failed.

2741. **Hoop Pine.** *Rep. Dir. For. Qd. 1954/55*, 1955 (9).

Scions from 15-year-old trees have been successfully grafted, and it is hoped that this may accelerate breeding work on this species, which produces seed only at 4-year intervals and is difficult to propagate by cuttings from old trees. [Cf. *For. Abstr.* 15 (No. 3509).]

2742. ZAK, B. **The grafting of Shortleaf and other Pine species.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 59, 1955. pp. 13. 10 refs.

A report on grafting experiments using scions from trees aged 2 to 89 years, on stocks aged 2 or 5 years, which developed out of an investigation into littleleaf disease [cf. *For. Abstr.* 11 (No. 3361)]. Successful unions are tabulated by material and methods used: 75% success was obtained with side and veneer grafts. Treatment to check resin flow and a Dowax treatment of scion shoots proved harmful, the latter presumably because of a toxic emulsifier. Intraspecific grafts took better than interspecific, though success varied greatly with scion source. Soft tissue grafting, considered promising for genetic research and quick propagation of clones, is described in some detail. Water relations are deemed the most important factor for grafting success. Stock pruning is also important, except for the soft tissue method.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See No. 2773.

232.33. Formation of Stands by Direct Sowing

See also Nos. 2771, 2794.

2743. OSTAPENKO, B. F. Gnezdovye posevy duba 1949 g. **[Nest sowings of Oak made in 1949.]** *Agrobiologija* 1955 (3), (111–6). [Russ.] I.M.I.

Gives data on survival and growth of shelterbelt sowings made in 1949 on the experimental farm of the Kharkov Agricultural Institute: (*a*) with 5 and (*b*) with 9 seed-spots per nest, each spot sown with respectively 7–8 or 4 acorns. In 1954 (*b*) had a mean height of 244 and (*a*) 217 cm., with root-collar diameter of 4 cm. in both cases.

2744. KRAJICEK, J. E. **Rodents influence Red Oak [*Quercus borealis*] regeneration.** *Sta. Note Cent. St. For. Exp. Sta.* No. 91, 1955. pp. 2.

Rodents destroyed, before germination, 68–95% of acorns placed on the soil and covered with leaves or planted 1 in. deep, and 55–95% of those protected by hardware cloth until germination had started and then uncovered. Insects destroyed the fleshy part of most of the germinating acorns undamaged by rodents. Further investigations are planned.

232.4. Formation of Stands by Planting

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 3053, 3072.

2745. MÜLLER. Anzucht von Lärchen-Wildlingen. **[Raising Larch wildings.]** *Wald* 3 (1), 1953 (30–1). [G.]

In March 1952 the mineral soil under a 102-year stand of 'Altmark' Larch was laid bare and lightly hoed before and during seed-fall. Regeneration, averaging 15 seedlings from 2 to 28 cm. high per sq. m. was found in October on ca. 30% of the strips; where light was good, up to 60 per sq. m. were counted. It is intended to transplant the larger plants direct, and the smaller ones to nurseries.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 2695, 2716, 2753, 2839.

2746. LUNDGREN, N., CALLIN, G., HANSSON, J.-E., and LINDHOLM, A. Om arbetstyngden

vid plantering. **[Heaviness of work in planting.]** *Skogen* 43 (6), 1956 (140–4). [Sw.sw.] (*Medd. SkogsforsknInst., Stockh., Ser. Uppsatser* No. 45.)

Studies on planting, using different tools [see *For. Abstr.* 16 (Nos. 4047–8)], were continued. Heaviness of work was determined from oxygen intake, pulse rate, body temperature, and sweating. Results indicated a classification of medium-heavy to heavy, although making the hole and the actual planting were less heavy work than clearing the ground with different types of mattock. Clearing was easier with the single-bladed or the SFI mattock than with the Mo-Do or the pick mattock. Planting in open holes, using a planting stick, was easier than using SFI mattock or plant auger. Oxygen intake was greater on grass-covered than on forest soils. Changes in air temperature had no significant effects on heaviness or speed of work within the relatively small range of air temperatures (ca. 15–22° C.) obtaining. The different implements and methods are illustrated by photographs and the results are given in graphs, both with English legends.

2747. MERZ, R. W., and FINN, R. F. **Yellow-Poplar responds to preplanting ground treatment.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 105, 1955. pp. 18. 15 refs.

In a study on a typical old field in S.E. Ohio, 5 methods (illustrated) were used. Trees were planted (1) on the ridge of a double furrow; (2) in the furrow of a single furrow; (3) in lines ripped to a maximum depth of 28 in. to loosen the subsoil; (4) in 2-ft.-square scalps; or (5) without previous site preparation. All preparation was finished in the autumn before planting. Planting was by bar, mattock or machine. Relative costs for the combinations of site preparation and planting methods are shown; machine planting without preparation was the cheapest and mattock planting on scalps the most expensive form. No significant difference was found in survival between site preparations or between planting methods. After making corrections for variations in soil depth, significant differences were found in height (means of bar, mattock and machine) 5 years after planting, as follows: (1), 4·4 ft.; in (2), 3·4; in (5), 3·2; in (3), 2·8; and in (4), 2·5. Corrected mean figures for planting methods were: machine planting 3·8 ft., mattock planting 3·2 ft. and bar planting 2·8 ft. The foliar N content increased from 1949 to 1954 and in the latter year ranged from 1·57% for plants in (3) to 1·84% for those in (1); the mean for all site preparations was 1·72%. Soil moisture was consistently lower for (1), but differences decreased from 1949 to 1951.

2748. SLOCUM, G. K., and MAKI, T. E. **Some effects of depth of planting upon Loblolly Pine in the North Carolina Piedmont.** *J. For.* 54 (1), 1956 (21–5). 7 refs.

A continuation of previous experiments [see *For. Abstr.* 13 (No. 1174)]. Survival in a well drained clay soil of 1 + 0 *Pinus taeda* planted out normally or with ¼, ½, ¾, ⅞, ⅞ or the whole stem except the terminal bud whorl of needles, buried, was not significantly different, but seedlings planted with ¼ of the root system out of the ground suffered nearly 20% greater mortality (significant). In all deep-planted *P. taeda* seedlings, current height growth was stimulated and growth differences continued to be significant for 2 years after planting. Similar responses are indicated in *Pinus echinata, P. virginiana* and *P. serotina.* With deep planting the original root system did not die nor were new rootlets developed above the collar. These results have considerable practical significance in machine planting.

2749. ROY, D. F. **Don't plant close to unbarked logs.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 101, 1955. pp. 1.

Three years after logging, bark of cull logs in the California Douglas-Fir region tends to slough off in large patches and smother seedlings planted near by for the sake of their shade.

2750. SCHREIBER, A. Pressballenpflanzung. (Ein Beitrag zur Verbesserung des Kulturbetriebes im Mittelgebirge). **[Planting with pressed balls. (A contribution to the improvement of planting methods in the [German] mountains.]** *Wald* 3 (1), 1953 (19–25). [G.g.]

Describes trial planting on poor, stony sites of 2 + 1 Spruce in balls produced from a mixture of compost and sandy loam, with lime and water added in a power-driven automatic press or with a combined press and transplanting tool.

232.43. Spacing and Arrangement in Plantations

See also No. 3122.

2751. MELZER, E. Diskussionsbeitrag zur Gruppenmethode (speziell für Fichte). **[A contribution to the discussion on [Lysenko's] group ['nest' planting] method (with particular reference to Spruce).]** *Wald* 2 (10), 1952 (313–8). [G.]

Compares relative plant losses, after an [unspecified] short period, in 8 series of circular groups varying in size, spacing, and number of (2-year) seedlings per group, on a weed-infested clear felling in Tharandt. Some support is found for the view that dense groups fare better on such sites.

232.5. Artificial Formation of Stands by Vegetative Propagation

2752. PODHORSKI, I. O razmnažanju topola motkama. **[Propagation of Poplar by setts.]** *Šum. List* 79 (9/10), 1955 (281–92). 9 refs. [Croat. croat.e.]

Describes the results of planting setts, 3–3·5 m. long, of Black, hybrid Black, and Balsam Poplars. The setts had no branches, were 5–6 cm. thick at the base, and had apical buds. They were put in holes 70 × 25 cm. at the surface, with vertical sides and a sloping 'bottom' extending from soil level to meet the vertical end-wall at 70 cm. depth. The holes were dug with one of the diagonals of the surface rectangle aligned with the prevailing wind, the shallow end of the hole being to windward and the setts being planted at the opposite end of that diagonal. In all, 254 Poplars setts were so planted in spring 1952 and 1953, of which 189 survived.

It is concluded that this method should only be used when the soil is constantly moist.

233. Afforestation

See also Nos. 2417, 2420, 2540, 2767–9, 2813, 3160, 3504.

2753. RICARD, L. Un essai de plantation résineuse dans une tourbière. **[An experiment in planting conifers on a peat bog.]** *Rev. for. franç.* 8 (2), 1956 (102–7 + 3 photos). [F.]

Describes an adaptation of the methods developed by the U.K. Forestry Commission. Sitka Spruce was planted along the edge of shallow drainage ditches. The upturned turfs (1 m. square) are lifted by hand, a seedling placed between them, and a third turf propped against the other two on the side away from the ditch. This results in a 3 m. spacing, and preliminary indications promise good survival and growth.

2754. DITTRICH, J. **Afforestation of bog soils [in Germany].** *Irish For.* 12 (2), 1955 (45–57). 6 refs.

The afforestation of bogland is considered with special reference to the bog types of Germany, which are described in some detail according to a natural classification based on topography and climate. The importance of structural differences among the peat-types, even within the Sphagnum peats, as a factor favouring or militating against successful reclamation for agriculture or forestry, is stressed. Comments are made, based partly on the results from the analysis of peat samples from Ireland, on the prospects of success in the afforestation of bog in Ireland. [Cf. *For. Abstr.* 16 (No. 1358).] *Author's summary.*

2755. JÜTTNER, O. 70 Jahre Heideaufforstung. **[Seventy years of heath afforestation.]** *Veröffentlichungen der Akademie für Raumforschung und Landesplanung* (*Raumforschung und Landesplanung Abhandlungen*) *Bremen-Horn* No. 27, 1954. pp. 191 + viii + 32 photos + 17 dgms. + 7 gphs. + 10 tbls. + 1 map. 117 refs. [G.g.] Price *DM.*10 (19*s.*).

The investigation covers the heath region proper, here termed 'central heath' (chiefly the Luneburg), the 'border heaths' roughly as far as Hamburg and Bremen, and the 'coast heaths', or Geests, from the Danish to the Dutch frontier. The region's history of settlement, land use and vegetation (e.g. deforestation for salt pans), and its climate and soils are described. The soils, mostly sands, vary considerably as to genesis, structure, nutrient content and water regime. Vegetation, mostly *Calluna*, with *Erica* spp. and other plants on fresher sites, is no sure indicator of site quality. Some open natural forests occur, mainly Pine, Birch and Juniper. The author describes the cultivation methods used in the early afforestations, e.g. the double-ploughing system of Quaet-Faslem, or those of Greve and Meinecke which included burning, and their effect on soils and stands as disclosed by recent observations. Today full cultivation in two or more stages, often preceded by burning (which the author deprecates) is preferred to strip or patch cultivation. Depth of ploughing is less important than the thorough mixing of the organic matter with the mineral soil. Suitable equipment for the comminution of the heather and its root layers is lacking. Agricultural intercropping gave good results. The results of soil-improvement measures, including Erdmann's raw-humus experiments, and of fertilizer trials, were observed on sample plots, e.g. at Oerrel, Neumunster, and Schleswig. The development and yields of various species, pure or in mixture, following various methods of cultivation and establishment (there was little tending or thinning) in different parts of the area are described in some detail. Scots Pine proved the most successful species on the poor, dry soils of the central heath, followed by Japanese Larch and Douglas Fir on frost-free sites. For the coastal regions, *Pinus contorta* and *P. nigra* var. *austriaca*, Norway and Sitka Spruce, and sometimes Fir, were used successfully. Hardwoods proved a failure in the first generation. Hazards discussed include frost, where the effect of even very small differences in elevation is stressed, wind (e.g. the use of lupins as windbreaks for plantations), poor water conditions (here root competition from encroaching heather is important), game, fire, insects (chiefly cockchafer larvae) and the fungus *Fomes annosus* (particularly dangerous on dry sites). A special chapter, based on over 1000 examinations, is devoted to the root formation of various species in relation to site.

2756. SCHELLING, J. Stuifzandgronden. **[Inland sand-dune soils.]** *Uitvoer. Versl. Bosbouwproefsta. T.N.O., Wageningen* 2 (1), 1955. pp. 57 + 6 maps. 12 refs. [Du.e.] [Stichting voor Bodemkartering, Wageningen.]

The genesis of the sand-dune areas and of different dune types in the Netherlands, and the development of soil profiles and of forest vegetation are discussed. Figures are given showing the moisture content and chemical fertility of different dune soils compared with brown forest soils. A provisional classification of dune soils is made, based on variations in humus content and soil formation, depth of blown sand, and nature of the buried soil profile. Measurements in a Scots Pine stand 45 years old show that the chief factor affecting growth is the humus content of the blown sand. Other factors are the depth of the blown sand and the nature of the buried profile. Site quality of Pine is substantially higher on old inland dunes than on similar soils of more recent origin from which the old dunes have developed. Douglas Fir can be planted on the best type of inland sand dune, and even on poorer types will grow better than Scots Pine. Larch should be restricted to the best dune soils. Corsican and Austrian Pines would probably grow rather better than Scots Pine. Methods of survey and the successful use of aerial photographs in this work are discussed.

2757. HARA, M., TANAKA, K., SAIKI, H., SUZUMOTO, M., and TANAKA, K. **[Studies of improvement methods of the poor afforested lands of Japanese Black Pine (*Pinus thunbergii* Parl.) in the coastal sand dunes (2nd Report).]** *Transactions of the Tottori Society of Agricultural Science, Tottori, Japan* 10 (3), 1954 (36–58). 7 refs. [Jap.e.] C.G.B.

In an afforestation experiment in the Koyama sand dunes, addition of N nutrients and mulching with volcanic ash soils improved the growth rate and the foliage of trees that had done badly. Mulching with barley straw and Black Pine needles proved less effective. In general, growth was better towards the margins of the afforested areas, particularly the western margins where drift sand accumulated. Difference became more marked 6 years after planting. Soil moisture was higher, surface temperature and evaporation lower, and rooting depth greater on the thriving plots than on the poor ones, which had shallow spreading root systems in the top 10 to 20 cm. of soil and competed severely with each other. *From authors' summary.*

2758. HEBB, E. A. **Operation Sandhills—two years later.** *Sth. Lumberm.* 191 (2393), 1955 (159–60). [Southern Forest Experiment Station.]

Planting trials with 5 Pine species in Florida, hand- or machine-planted on sandhills prepared and cleared of roots with heavy machinery, showed the following survival %s after 2 years: Slash, 93, Loblolly 92, Shortleaf 89, Longleaf 41, Monterey 18. Slash Pine was also first in height growth and form. Loblolly, Shortleaf and Monterey suffered badly from tip-moth attack, and the last-named also from webworm.

2759. DENUYL, D. **Hardwood tree planting experiments on strip coal mine spoil banks of Indiana.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 619, 1955. pp. 16.

Trials with 10 hardwood species during a 5-year period: (1) *Fraxinus pennsylvanica* var. *integerrima* showed good survival and initial growth on all but the most acid spoil. (2) *Populus deltoides* did best on calcareous spoil. (3) *Liquidambar styraciflua* appears to be a species that will grow on acid spoil. (4) *Robinia pseudoacacia* is best suited for planting on spoils where other species fail to become established. It may also have a place in mixed hardwood planting. (5) *Acer saccharinum* showed fairly good initial growth on acid and calcareous spoils, but its multiple stem habit is undesirable. (6) *Platanus occidentalis* attained its best initial survival and height growth on calcareous and slightly acid spoils. (7) *Liriodendron tulipifera* and *Juglans nigra* are not generally adapted for spoil-bank planting and should be confined to calcareous spoil. (8) *Ailanthus altissima* and *Acer rubrum*, are not suitable for spoil-bank planting.

2760. ANDRADA, E. DE CAMPOS, and GONÇAVES, I. BOTELHO. Projecto de arborização do Perimetro Florestal da Serra do Poiso (Ilha de Madeira). **[Plan for the afforestation of the forest limits of the Poiso Range (Madeira).]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 57–E4, 1955. pp. 79 + 2 maps + 8 dgms. [Port.] Limited distribution.

Presents data collected, preliminary to afforestation of this area of ca. 2643 ha., on soils, hydrology, climate, vegetation and agricultural practices, with plans for selection of species and choice of site, methods of establishment, future grazing regulations, nurseries, communications, fire posts, torrent training and an estimate of the costs of the whole project.

2761. PEPE, G. Il rimboschimento di Costa d'Alpe e Brallo. **[The afforestation of Costa d'Alpe and Brallo.]** *Monti e Boschi* 7 (1), 1956 (18–28). 4 refs. [It.]

An account of the successful afforestation, between 1927 and 1955, of two denuded mountain areas in the province of Pavia.

2762. SOLJANIK, I. Značaj oglednih polja kod vestačkog pošumljavanja. **[Significance of trial plots in artificial afforestation.]** *Šumarstvo* 8 (9), 1955 (551–63). 24 refs. [Serb.e.f.]

A plea for small trial plots as a means of avoiding the numerous afforestation failures of the past 40 years in Serbia. Various lay-outs are described and illustrated for different planting and soil cultivation methods.

2763. MOONEY, H. F. **Some observations on afforestation in Jordan.** British Middle East Office, Beirut. 1955. pp. 18. Limited distribution.

2764. **Afforestation of waste lands in the Southern Circle.** *Rep. For. Adm. W. Bengal 1951/52*, 1955 (26).

The general pattern of afforestation is to have a matrix of fuel species (*Cassia siamea, Terminalia arjuna, Albizzia* spp., *Acacia moniliformis* etc.) which will be coppiced on a short rotation, with matchwood, plywood, and general-utility timber species at wider spacing to remain as standards until they reach exploitable size. Intensive ridge-and-furrow soil preparation has given encouraging results, some species having attained an average height of 5 ft. in one season. The use of 2- to 3-year-old transplants gave much better results than that of 1 + 0 stock. Peculiar problems are presented by *beel* areas, waterlogged depressions that undergo seasonal inundation. Here *Barringtonia acutangula* has been found to be the only species that can stand prolonged and even complete submersion.

2765. VIGNAL, P. Les reboisements en *Pinus patula* de la Haute-Matsiatra. **[Afforestation with *P. patula* in the upper Matsiatra basin in Madagascar.]** *Bois For. Trop.* No. 45, 1956 (15–25). [F.]

Afforestation of these plateau grasslands began in 1950, and it is intended ultimately to plant 7000 ha. with *P. patula*, which are planted closely and thinned at 5, 7, and 9 years. Nursery technique is described in some detail. Owing to shortage of labour, soil preparation has had to be mechanized as far as possible, and cultivation is done with tractor-drawn subsoilers working along the contours. Planting is by hand with 1 + 1 balled stock and teams of 3 men and 2 women, the plants being set in the bottom of the furrows. Results so far have been good.

234. Formation of Forest by Natural Succession

See also No. 2601.

2766. LEISMAN, G. A. **A vegetation and soil chronosequence on the Mesabi iron range spoil banks, Minnesota.** *Abstr. of thesis*, in *Dissert. Abstr.* 15 (11), 1955 (1987–8). [University of Minnesota.] O.R.S.

A study was made in 1952–53 on stripping (I) and lean ore (II) banks up to 51 and 31 years old respectively. Plant succession on (I) usually led to an Aspen/Balsam-Poplar woodland community with numerous herbaceous weeds as ground cover, but some of the older banks had a grassland vegetation with few trees, probably because of poor seed years or lack of moisture during the first 5–10 years after bank deposition. Aspen and Balsam Poplar were also important pioneer species on (II) but were very susceptible to insect and fungus attack and were frequently deformed and stunted; herbaceous cover was sparse and patchy. Growth rates of both tree species were poor, being poorest on coarse (II) sites. Available N, P and K were low in both (I) and (II). Improvement in site quality can be expected on (I) because of the high incidence of herbaceous ground cover, but not on (II), except through incorporation of leaf litter, because of the sparsity of herbaceous cover and resistance of lean-ore particles to weathering. A study of Balsam Poplar clones from root-suckers indicated a very rapid clonal expansion especially southwards, probably because of the sunshine falling on the southern edge of the clone. Only a small initial number of seedlings are needed on a newly-formed spoil bank to produce finally a complete Poplar cover. Growth rates of the clonal members were remarkably constant in spite of differences in direction of expansion and amount of shade, probably because of interchange of growth materials through the interconnecting roots.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 2662, 2672, 2674, 2681–2.

2767. Kovács, Z. N. Erdösítési, fásítási irányelveink a Duna Tisza-közi homokhátakon. **[Directives for afforestation and tree planting on sandy ridges in the region between the Danube and Tisza.]** *Erdö* 4 (3), 1955 (103–8). [Hu.]

For the next 6 years, planting of 16,000 Scots and Austrian Pine, 10,000 Robinia and 9000 Grey Poplar seedlings annually is contemplated in a drive to regenerate deteriorated stands of 5- to 15-year-old Robinia on poor sands. Some stands are to be clear-felled and replaced with Pine; others underplanted with Pine and Poplar. Underplanting with conifers will be at the rate of 6000–8000 seedlings/ha. and spacings adopted will be 1·5–2 × 1 m. for Poplar and 1·5 × 1 m. for Robinia. Special attention is to be paid to cultivation measures in the new plantations, since experience shows an 11–16% increase in survival and 60–70% in improved growth through thorough hoeing repeated two or three times.

2768. Fuisz, J. Akácosítás és fenyvesítés a Nyírségben. **[Afforestation of the Nyirség with Robinia and Pine.]** *Erdö* 4 (3), 1955 (132–5). [Hu.]

Some 60–65% of the forested area in this predominantly acid sandy region carries Robinia, about 30% of the stands growing on unsuitable sites and requiring regeneration. It is planned to regenerate 2000 ha. annually, so as to achieve an ultimate proportion of 40–45% Robinia to 20–25% Pine, with preference for Scots rather than the more exacting Austrian Pine. Suitable sites for reforesting with pure stands of Robinia are the fertile yet dry soils from which the former Oak stands have disappeared. Robinia is to be removed from the poorest sites and replaced by Pine mixed with Grey Poplar and *Celtis* [*australis*?].

2769. Halász, L. A fenyö és az akác fontossága a Duna Tisza-köze homokjainak erdösítésénél. **[The importance of Pine and Robinia for the afforestation of sandy areas between the Danube and Tisza.]** *Erdö* 4 (3), 1955 (129–32). [Hu.]

Afforestation with Austrian Pine on calcareous dry sands (except in areas where *Fumana procumbens* predominates) and with Scots Pine on the less dry sands is recommended, neither pure but mixed with Robinia, Poplar or *Celtis*, which promote litter decomposition and humus formation. Pure stands of Robinia ought to be limited to fertile, well aerated medium-heavy soils. Planting and protection of seedlings against wind-blown sands are briefly discussed and the value of Robinia in honey production is stressed.

2770. **[Conversion of old Cacao plantations to timber plantations.]** *Rep. For. Dep. Trin. Tob. 1954*, 1955 (14, 16).

An experiment is being made in Trinidad to convert old Cacao plantations in the catchment areas of new dams to valuable timber plantations. Tenders for the right to reap cocoa over a 5-year period were called for, and have brought in enough revenue to pay for the sowing and tending of timber trees established in groups or lines through the Cacao. Under the cocoa license, the licensee will maintain the Cacao and the planted trees, and the Forest Department has retained control of all shade cast by the Cacao or the shelterwood of *Erythrina*, which will be manipulated to give the optimum shade to the timber trees, whether planted or natural. It is proposed to use *Swietenia macrophylla*, *Cedrela mexicana*, *Cordia alliodora*, *Tabebuia pentaphylla*, *Chlorophora excelsa* and *Nauclea diderrichii* as timber species, and there is already considerable regeneration of *Hura crepitans* on the ground. In the first attempt, seedlings suffered from excessive shade and the late date of sowing (July). To succeed, the species used need the much greater amount of light that will reach the forest floor after the Cacao has been cleared of weed growth by the licensee. Group sowing appears to be preferable to line sowing, so as to take advantage of breaks in the canopy.

2771. **Forest management research. The American Virgin Islands.** *Carib. For.* 16 (1/2) 1955 (9–10). (*15th Rep. U.S. Trop. For. Res. Cent. 1954.*)

The object of research in the Virgin Islands is to develop cheap methods of increasing the representation of Mahogany in existing secondary stands. Broadcasting of seed of *Swietenia macrophylla* beneath an opening in the forest at Annaly Estate gave germination of 38% of the viable seed. At the end of 1 year 66% of the original seedlings had survived and were growing. Measurements in naturally established stands of *S. mahagoni* suggest the desirability of keeping the stands fairly open.

2772. VASCONCELOS, P. W. CABRAL DE. Consorciação de saguaragi e eucaliptos. **[Mixing of *Colubrina rufa* and *Eucalyptus* spp.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (302–6). [Port.e.] [Escola Superior de Agricultura 'Luiz de Queiroz'.]

C. rufa was raised from seed and planted out into existing Eucalypt stands. The species proved thrifty and tolerant of the shade of the Eucalypts. Figures are presented showing volume and money yields for one such plantation.

2773. FILHO, A. F. COIMBRA, and MAGNANINI, A. Considerações sôbre *Mimosa pudica* no combate à erosão superficial. **[*M. pudica* for erosion control.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (131–6). [Port.e.]

Mimosa pudica is recommended for controlling surface erosion because of its abundant seed production, strong root system, and drought resistance. Seedlings ca. 15 days old should be pricked out individually into wooden containers, roughly 8 cm. × 8 cm., and planted out when they are ca. 3 months old. The soil should be inoculated with nodule-forming bacteria. Optimum spacing is 60 × 60 cm.

2774. FILHO, A. F. COIMBRA, and MAGNANINI, A. Considerações sôbre o uso de *Wedelia paludosa* na humificação de solos recém-reflorestados. **[The use of *W. paludosa* for humification in soils of recently reforested areas.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (229–34). [Port.e.]

Brief notes on the usefulness of this species as a cover crop in tropical areas.

2775. TROUP, L. C., and JOHNSTON, D. R. **The pattern of mixtures.** *Forestry* 29 (1), 1956 (60–8). 5 refs.

The authors consider the main reasons which may justify the planting of mixtures rather than pure crops, e.g. the provision of nurses, intermediate returns, continuity of employment, biological considerations, health, fuller utilization of the site, improvement of form etc., and give four examples of possible patterns for mixtures in strips to suit varying circumstances. *Authors' summary.*

2776. JENTSCH, J. Untersuchungen über die wuchsfördernden und bodenbessernden Eigenschaften der *Pinus strobus* (Weymouthskiefer, Strobe) als Mischholzart auf kritischen Böden (Auswertung 30jähriger Versuchsanlagen im vogtländischen Schiefergebiet). **[Researches on the growth-promoting and soil-improving properties of *P. strobus* as a species for mixtures on critical soils. (Appraisal of 30-year plots in the Vogtland phyllite soils region).]** *Arch. Forstw.* 4 (2/3), 1955 (97–169). 99 refs. [G.g.]

A detailed long-term comparison of the growth in 5 pairs of plots of Spruce [*Picea abies*] grown pure and in mixture with Weymouth Pine (*Pinus strobus*). Covers history; site conditions; height, diameter, and root growth; needle length and weight; and ground flora. The 28- to 46-year stands grow on critical soils based on micaceous, shaly, and quartzitic phyllites, unstable physically, chemically, biologically, and in water retention. They have been subjected for a century to litter removal. Pure Spruce on these sites is unhealthy and stagnant, and the admixture of Weymouth Pine has definitely improved its growth (up to 63 and 79% in height and diameter respectively, raising the height quality class by 66 to 166%). Mixtures with Scots Pine and Larch have effected no improvement. The Pine, even on these poor sites, has shown its characteristic growth, being superior to the Spruce mixed with it by 43, 83 and 273% in height, diam., and b.a. respectively. To curb the early exuberance of the Pine and to maintain the mixture with Spruce as chief species, special thinnings, beginning, according to site in the 10–15th year and ending by the 35th without detriment to further normal thinnings, are recommended. These, striking a balance between opportune reduction of the height c.a.i. of the Pine and the longer continued height increment of the unimpeded Spruce, give a high-yielding final crop, to the volume of which the Pine is the main contributor. The effect of the Pine depends on an intimate mixture at formation; interplanting long-stagnant Spruce has little or no effect. The observed improvements exerted by the Pine on site conditions and even on the root growth of the Spruce, despite its own shortcomings in root growth, are detailed. Limited areas, however, of degraded quartzitic phyllite soils exist in the Adorf range where the Pine can only hold its own and Spruce is not benefited.

2777. MCNAMARA, E. F., and REIGNER, I. C. **Root competition slows growth of plantings on unprepared sites in scrub Oak.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 54, 1955. pp. 3. 1 ref.

Mean heights of seedlings of Red, Jack and Pitch Pines planted in 1950, (1) in bulldozed furrows 4 ft. wide, (2) in strips 4–5 ft. wide treated with Ammate in 1949, or (3) interplanted in scrub Oak without any form of brush clearing, were compared in the winter of 1954–55. Seedlings in (1) were taller than those in (2) except for Jack Pine which was slightly taller in (2), and those in (3) were 32, 40 and 43% shorter than those in (1), for Red, Jack and Pitch Pines respectively. All trees in (1) have heavier branches and more leaves and are generally more vigorous.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)

See also Nos. 2693, 2767.

2778. ZEHNTNER, K. Das Ausschneiden von forstlichen Kulturen: (Beitrag zur Werkzeugfrage). **[The weeding of forest plantations: a contribution to the study of tools.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 31 (2), 1955 (321–44 + 9 photos). 2 refs. [G.g.f.]

A study of several types of tool (scythes, hooks etc.) and a motor weed-cutter (the 'Wiesel'), with comparative times and costs. The importance of choosing the right implement for the vegetation, terrain etc. involved is stressed. A factor of the first importance is the regularity of planting and provision of sufficient room between rows.

2779. MAGUIRE, W. P. **Radiation surface temperature and seedling survival.** *For. Sci.* 1 (4), 1955 (277–85). 7 refs.

[Cf. *For. Abstr.* 15 (No. 10).] Cloudless-sky horizontal-surface, solar and sky radiation values for sunlight hours throughout the year at the Institute for Forest Genetics at Placerville, California (2760 ft. altitude and 39° N. lat.) are calculated from Fritz's equation, and these and the daily maximum surface soil temperatures are graphed. It appears that extreme surface soil temperature possibilities may be anticipated eventually from computed radiation curves. Important considerations for the proper placing of artificial shade for level, north and south exposures, the quantitative effect of shade in reducing soil temperatures, and the quantitative and durational effect of rain on soil temperatures are described. The high surface temperatures of litter and duff during germination are suggested as a possible reason for failure in establishment. The results are given of an experimental planting of 2 + 0 *Pinus ponderosa* showing a 400% greater survival and better growth for shaded seedlings.

237. Amelioration of Forest Sites

See also Nos. 2555, 2678, 2723, 2755, 2757, 2776.

2780. KREMSER, W. Die Bewirtschaftung der Kiefer auf Grundwasserböden. [**The management of Pine on groundwater soils.**] *Forst- u. Holzw.* 10 (16; 17), 1955 (323–5; 345–7). 6 refs. [G.g.]

The author discusses the differences between various types of groundwater—stagnant, moving, calcareous, acid, etc.—and of the soils involved, particularly the thickness of peaty layers, in their effect on treatment. In general, draining with careful attention to both surface and mineral soil levels is essential for successful control of the water supply, which should be increased in the later stages of stand development. In very thick peat layers with calcareous groundwater, lowering of the water-table may be harmful. Ordinary soil preparation, as on other sites with peaty transition and raw humus layers, i.e. down to the mineral soil, either in strips, patches or complete, will often suffice. On difficult sites, ridge planting, or, preferably, sand mulching [cf. *For. Abstr.* 15 (No. 3530)] is recommended. Tending in early years should aim at early closing of the stand rather than increment.

2781. GRÜNIG, P. E. Über den Einfluss der Entwässerung auf die Flachmoorvegetation und auf den Zuwachs der Fichte und Bergföhre im Flyschgebiet der Voralpen. [**The influence of draining on wet peatland vegetation and on increment of *Picea abies* and *Pinus mugo* in flysch areas of the Voralps.**] *Repr.* from *Mitt. schweiz. Anst. Versuchsw.* 31 (2), 1955 (421–92 + 4 tbls.). 234 refs. [G.g.f.]

A study was made during 1950–52 of an area that had been drained during 1932–38, and planted year by year with a mixture of Spruce, Mountain Pine and broadleaved species. The first part of the report deals with changes in the ground flora. It was found that draining did not markedly modify the vegetation of a wet peat site in the first 15 years; such changes as were observed were in the distribution of existing species and did not include the introduction of new species. The change in the proportion of species was most marked to a width of 1·5 m. on each side of the drainage ditches. A study of the increment of Spruce and Mountain Pine was made in 4 stands, with the following results : (1) Both diameter and height increment may be significantly increased by draining wet peatland forests, the two species reacting similarly. (2) The effect of draining lessens with distance from the drainage ditches. (3) The width of annual ring increased immediately after draining. The period of increased width lasts, however, only for 5–6 years, and diameter growth then resumes the usual rate. (4) It is finally concluded that both draining and soil cultivation are economically practicable in flysch areas.

2782. LUKKALA, O. J. Metsäojituksen työsaralta. [**Draining swamps for forest use.**] *Metsät. Aikak.* 1955 (12), (399–404). [Fi.e.] (*Metsätietoa, Helsinki* No. 2, 1955.)

Includes [tabulated] results of observations on permanent sample plots in drained areas in different parts of Finland, showing that drainage had increased growth. Mechanical methods are superseding hand digging. Cost of drainage, using a tractor-drawn plough, is about ⅓ that of hand digging. *From author's summary.*

2783. BINDSEIL. Natürliche Waldbodendrainierung. [**Draining forest land by natural means.**] *Forst- u. Holzw.* 10 (8), 1955 (165). [G.]

Describes the successful draining of a waterlogged meadow by planting 4- to 5-year-old Spruce transplants on mounds. The trees, now 45 years old, have reached heights corresponding to site class I.

2784. MØLLER, C. M. Gødningsforsøg i skov. [**Fertilizer experiments in the forest [with some supplementary corrections and emendations].**] *Dansk Skovforen. Tidsskr.* 39 (4; 6), 1954 (165–216; 396–402). 37 refs. [Dan.e.]

Describes the design of an experiment laid out in 1953–54 in young Beech and Norway Spruce plantations (ca. 20 of each) on representative sites, to study the influence of fertilizer treatment ($Ca(NO_3)_2$, KCl or superphosphate) on height growth, and of a smaller investigation on the possible influence of fertilizers on b.a. increment of young Beech, Ash and Spruce. Tabulates results of soil analyses at the various sites and also summarizes results of investigations in Denmark, Sweden, Germany, Holland, Great Britain and the U.S.A. since ca. 1900.

2785. THEMLITZ, R. Beitrag zur Wirkung von Hüttenkalken auf die Rohhumusumwandlung und das Wachstum von Kiefernsämlingen. [**The effect of foundry slags on the transformation of raw humus and on the growth of Pine seedlings.**] *Sitzungsberichte, Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig* 4 (3), 1955. pp. 15. 11 refs. [G.g.] H.S.B.

Raw humus from a Spruce stand was mixed with commercial limes, a mixed lime (*a*), and $CaCO_3$ (*b*), having 58·9 and 44·2% effective base content

respectively, and 2 pulverized foundry limes of approved fertilizing quality, Meiderich (*c*), and Stürrelberg (*d*), having 45·2% and 55·9% CaO + MgO respectively. All were spread in a 3-cm. layer on biologically active soil in the Botanical Gardens at Hann. Münden, at rates corresponding to 2000 and 4000 kg. CaO/ha. All the limed plots, but not the control, soon showed earthworm activity. On examination 8 months later, pH had improved about equally on (*a*) and (*d*), and least on (*b*) plots. The amounts of exchangeable K were nowhere noticeably changed. The amount of citric-acid-soluble P_2O_5 rose on all limed plots, but particularly on that treated with (*c*), this slag having a high P_2O_5 content. No significant change in the N content of the organic material had occurred, but there was an increase in sorption capacity. This was again most marked in (*a*) and (*d*) plots, and least in (*b*). The same substances were tried with *Pinus sylvestris* seedlings planted in pots filled with (1) a loamy soil derived from Kulmgrauwacke, and (2) a nutrient-deficient heath sand: (1) received 0·33% CaO or CaO + MgO, (2) 0·28%, plus doses of P, K and N. Both soils were originally acid and the change in their pH levels corresponded to the results in the raw humus trial. On both (1) and (2) total dry-matter production was greatest with (*c*), an effect of its P_2O_5 content. Increase in CaO content of the plants was about equal in all fertilized plots, but (*c*) and (*d*) raised the Mg content, and (*d*), though poor in P_2O_5, assisted its uptake from (1) better than (*a*) or (*b*). It is concluded that foundry slags, particularly if rich in bases, are at least equal to $CaCO_3$ as a source of lime, and superior in that they favour Mg and P uptake. [Cf. *For. Abstr.* 14 (No. 1150).]

2786. BRÜNING, D. Ein Beitrag zur Forstdüngungsfrage. [**A contribution to the fertilizer question in forestry.**] *Wald* 2 (11; 12), 1952 (338–42; 367–72). 40 refs. [G.]

Provisional results of experiments on a very poor and acid sandy soil in the Stendal district [Saxony]. Average length of shoots of 1-year *Robinia pseudoacacia* seedlings after 6 months was ca. 46% greater after treatment with quicklime and superphosphate, a further 25–40% greater where K_2O had been added, and another 10% for additional $MgSO_4$.

238. Timber Plantation Crops Requiring Special Treatment

See also Nos. 2482, 2639.

2787. MORELLI, A. L'assestamento della consistenza pioppicola. [**Management of Poplar plantations.**] *Agricoltura delle Venezie, Venezia* 8 (8), 1954 (577–86 + 3 forms). [It.] C.G.B.

Discusses the general problems of management in Poplar plantations consisting of rows spaced well apart above agricultural crops, and gives detailed recommendations (with specimen forms) for drawing up working plans for them.

2788. PONTICELLI, P. Sviluppo della pioppicoltura ferrarese. [**The development of Poplar-growing in the Province of Ferrara.**] *Cellulosa e Carta* 6 (12), 1955 (3–10). [It.f.e.]

The province consists for the most part of reclaimed (largely irrigated) land and much Poplar has already been planted. The respective merits of special plantations and planting in strips along watercourses is discussed and decided in favour of the latter.

24. Tending of Stands and Trees

241. Cleaning

2789. CALLIN, G. En orienterande studie över tidsåtgången vid röjning. [**A preliminary study on the time taken in cleaning.**] *Medd. SkogsforsknInst., Stockh., Ser. Uppsatser* No. 33, 1955. pp. 12. [Sw.sw.e.]

Time studies were made in Central Sweden in 56 sown stands of Pine at different stages of development and of different stand densities. Some Spruce and hardwoods were present. The Sandvik cleaning axe, Sandvik I, proved suitable for stands with a mean height of 1·5-2 m. and a cleaning scythe for smaller stands; both these tools are illustrated. Mean height and number of stems per ha. to be cleaned proved to be the most important factors affecting time taken. Plots near the coast required on average about 8% more labour and those inland 8% less than the general average; this difference is attributed to the poorer stem form and greater knottiness of the trees in coastal regions. Figures are tabulated showing the relative time consumption for different mean heights and number of trees to be cleaned per ha. Other factors affecting time are stem form, knottiness, lean, amount of Spruce present, etc. The number of axe-stokes per stem for stems of different mean heights is roughly the same for Pine and Birch but higher for Spruce. A further table shows the relative time for trees of different mean height, using a cleaning scythe, cleaning shears and the Sandvik axe.

242. Thinnings

See also Nos. 2557, 2582, 2649, 2681, 2683, 2685, 2941, 2977, 3115, 3120, 3123, 3130–1, 3183–4.

2790. MARTIN, R. M. **A token system of payment for piecework thinning.** *N.Z. J. For.* 7 (2), 1955 (89–91).

The system was devised for thinning *Pinus radiata* stands planted 1939–42, at 6 × 6-ft. spacing, present height 75 ft., d.b.h. up to 15 in. Thinning reduces stocking from 800 to 375 stems/acre, the diameter range of thinnings being 4–12 in. There is a shortage of labour in the district, and little demand for small wood, so that thinning operations are difficult and expensive. Time and motion studies were made on the whole operation. It was found that the only significant item was the time taken in the actual felling of stems of varying diameter. Times for all subsidiary operations, trimming before felling, movement from tree to tree, tool maintenance and so on, were constant. Significant increases in time for actual felling occurred only at certain points on the diameter curve, at 6 and 9 inches respectively. It was possible therefore to group all stems in 3 diameter classes (0–6·5, 6·5–9·5, over 9·5 in.), fixing for each a felling price per tree. The 'price

time' is considered to be the rate at which a competent axeman could carry out the work and earn £2. 13 a day, irrespective of variations in site class.

Before thinning begins, all trees to be removed are blazed. A branded brass token, marked with a letter corresponding to one of the diameter classes, is inserted in a downward cut, on each marked tree, each token measuring 3 × 0·75 × 0·008 in. Fixed calipers are used where there is any doubt in judging diameter class. Marking is carried out immediately ahead of the thinning gang, not more than two days' work being marked in advance. Before felling each tree, the axeman pockets the token and at the end of the day all tokens are handed in and recorded for payment. The use of this system has increased the rate of thinning operations, reduced costs, and held payments to workmen more or less constant, irrespective of changes in working conditions.

2791. BORZUCHOWSKI, R. **Partial time study of a second-growth Hemlock thinning.** *Res. Note B.C. For. Serv.* No. 30, 1955. pp. 12 + 4 photos.

The report, based on a detailed time-study of thinning in a 55-year, second-growth stand of *Tsuga heterophylla*, covers the wood produced by a 3-man crew using one D-6 tractor over a 7-day period. The study is broken down into the time involved in each separate phase of the operation (felling, trimming, cross-cutting, skidding, hauling, bundling etc.). Additional data record the number and size of trees felled and logs made. In this particular instance it appeared that a 3-man crew might not be the most efficient work unit, and a hypothetical case is made out for a 5-man crew. Partial data are included on the use of one tractor *vs.* two, with a 3-man crew.

2792. PENISTAN, M. J. **Growing softwoods for quality.** *Quart. J. For.* 50 (1), 1956 (34–43). 13 refs.

Continues a controversy begun in earlier articles [cf. *For. Abstr.* 16 (Nos. 4075–6], stressing the importance of thinning to concentrate growth on the finest, not the largest stems, and control of early growth and heavy branching by interplanting or planting in forest conditions.

2793. MACDONALD, J. M. **Thinning Sitka Spruce.** *Scot. For.* 10 (1), 1956 (26–30). 5 refs.

Suggests some of the considerations that may apply to the thinning of Sitka Spruce plantations in regions of moderate growth. The importance of heavy crown thinning is stressed.

2794. SIRÉN, G. Männyn taimistojen käsittelystä. **[The treatment of Pine seedling stands.]** *Metsät. Aikak.* 1956 (1), (5–12). [Fi.e.]

On the basis of his own observations and earlier investigations in natural Pine stands, the author recommends patch sowings at 2·0–2·5 m. spacing which, with proper tending, should give between 1800 and 2500 trees per ha. at the first merchantable thinning. Only the competitors most dangerous to dominants should be removed in thinning. Thinning when the stand reaches a height of 1·3–5·0 m. (optimum 2–4 m.) is recommended. Results of a thinning experiment [tabulated], in which the number of trees was reduced from 24,000 to 2900/ha. without any loss of volume increment, are presented. The same results can be obtained by removing only the most serious competitors (mainly co-dominants) of dominant trees; the trees of the lowest crown layer disappear naturally.

2795. ALEXANDER, R. R. **Two methods of thinning young Lodgepole Pine in the central Rocky Mountains.** *J. For.* 54 (2), 1956 (99–102). 8 refs. [Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.]

Pinus contorta, profusely regenerated on a burn at 8800–9000 ft. altitude was treated 35 years later by (*a*) thinning the dominants and codominants to ca. 630 per acre, (*b*) cutting out growth in an 8-ft. radius round the best 100 crop trees per acre, (*c*) leaving the stand unthinned. Increment borings made 8 years later in the 100 crop trees of (*b*), and in 100 comparable stems in each of the other treatments, showed that the best mean diameter growth was made in (*a*), but this method is more expensive in labour and supervision and may have to be repeated before the final cut. Where small trees cannot be sold, (*b*) is therefore recommended. A rough estimate of the rotations required for the best 100 trees per acre to reach a mean diameter of 10 in. in the conditions described, would be for (*a*) 73 years, (*b*) 81, (*c*) 94.

2796. FOILES, M. V. **Effects of thinning a 55-year-old Western White Pine stand.** *J. For.* 54 (2), 1956 (130–2). [Intermountain Forest and Range Experiment Station, Ogden, Utah.]

Half-acre plots, the dominants of which were 60% *Larix occidentalis* and 30% *Pinus monticola*, were subjected to the following treatments: (*a*) left unthinned; (*b*) thinned lightly in 1914, 1924 and 1934; (*c*) thinned lightly in 1914 and 1934; and (*d*) thinned heavily, leaving crop trees, in 1914. The changes in diam., b.a., volume, composition and stem numbers from 1914 to 1949 are compared, to provide an interim guide to treatment of the Pine. Its proportion in the crop remained almost constant in (*a*), increased by ca. 20% in (*b*) and (*c*), and by 8% in (*d*).

2797. LUNDBERG, J. Urskov og stærk hugst i bøg på Krenkerup. **[Virgin forest and heavy thinnings in Beech at Krenkerup.]** *Dansk Skovforen. Tidsskr.* 39 (5), 1954 (229–37). [Dan.]

Comparison of two neighbouring plots, one untouched apart from the removal of dead trees and the other thinned to leave about 20 sq. m. b.a./ha. between thinnings at 68, 72, 75 and 83 years, shows that annual volume increment on the thinned plot averages 10–15% lower than on the untouched plot.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 2662, 2680, 3138.

2798. MINCKLER, L. S., and ROACH, B. A. **First steps in managing central hardwood forests.** *Sth. Lumberm.* 191 (2393), 1955 (119–22). [Central States Forest Experiment Station.]

Enumeration of 420 acres of a typical upland hardwood forest in S. Illinois showed an average of

39 sawtimber-sized (> 10·6 in. d.b.h.) and 94 pole-sized (4·6–10·5 in.) trees/acre. About half of these were potential growing stock, 10% of the timber and 18% of the pole trees being culls, and the rest of low quality but merchantable. Where a complete rehabilitation cut [improvement felling] was made, i.e. all culls killed and all other timber except potential growing stock felled, stand volume increased from 2030 to 3360 bd. ft./acre over 4 years; where only a light cut had been made, i.e. only poor-risk trees removed apart from culls, the increase was from 3590 to 4680, and in the untreated stand from 9700 to 9880. Improvement cuts also promoted regeneration of the more valuable species. Costs of a complete rehabilitation treatment including cull killing (ca. $31/acre) should be easily covered by the sale of the ca. 2000 bd. ft./acre harvested.

2799. GRANO, C. X. **Behaviour of Southern Arkansas Oaks girdled in different seasons.** *J. For.* 53 (12), 1955 (886–8).

From girdling (2in. wide, into wood, at 3 ft.) in 108 half-acre Pine/hardwood plots, monthly through 2 dormant, and fortnightly through 2 growing seasons, it was found that the most rapid kill, the highest mortality and the fewest numbers recoppicing in *Quercus falcata* and *Q. stellata* occurred when trees were girdled while expanding new leaves (mid-April to end of June). Season of girdling did not affect the number of sprouts or size of coppice clump.

2800. LEONARD, O. A. **Effect on Blue Oak (*Quercus douglasii*) of 2,4-D and 2,4,5-T concentrates applied to cuts in trunks.** *Journal of Range Management, Portland* 9 (1), 1956 (15–9). 11 refs.

The effects were studied in relation to spacing, height and depth of cuts, form and dilution of herbicide, and seasonal differences in sensitivity. Four-inch spacing of the cuts gave the best kills with the least volume of chemical. Cuts made close to the ground were slightly more effective than cuts made higher on the trunk in killing the tops, but were much more effective in preventing sprouting from the base. The sprouts, however, eventually died, so their formation was of no importance. Amines of 2,4-D and 2,4,5-T were much more effective when applied to the sapwood than to the bark. Amines were considerably more effective than the esters, especially at the lower dosages used. The 2,4,5-T amine was equal to the amine of 2,4-D, while the amine of MCP was much less effective. The ester of 2,4,5-T, was superior to the ester of 2,4-D. Dilution of 2,4-D amine with water did not raise effectiveness but increased the time necessary for making effective application and added to the bulk of material to be carried. An abrupt increase in effectiveness took place between 6 October and 4 November. The increase in November appears to have been associated with an increase in soil moisture and a decrease in air temperature. The trees remained sensitive throughout the winter and spring months. *From author's summary.*

2801. JOKELA, J. J., and LORENZ, R. W. **A comparison of three methods of eliminating cull trees from woodlands [in Illinois] with 2,4,5-T.** *J. For.* 53 (12), 1955 (901–4). 1 ref.

Using 16 lb. acid equivalent/100 gal. kerosene, trees 3–10 in. diam. were (*a*) thoroughly wetted by basal spraying to a height of 18 in.; (*b*) stabbed with contiguous cuts with the Cornell tool [see *For. Abstr.* 7 (No. 752)] round the tree at a height equal to stump diam.; and trees 10–20 in. diam. were (*c*) axe-frilled at a height of 18 in. and spray directed into the frill, or (*d*) treated as (*b*). Tables and graphs show injury ratings (Hickory, 6 species of Oak, Elm, Ash etc.), time taken and cost of treatment. For (*a*) and (*c*) the strength could be reduced probably to 12 lb./100 gal. For (*b*) and (*d*) stronger solutions applied at wider intervals hold great promise in portability, ease of operation and low cost. Resprouting was unimportant in all treatments.

245. Tending of Trees, Pruning etc.

See also Nos. 2868, 2977, 3154.

2802. BARAŃSKI, S. Podkrzesywanie sosny jako element pielęgnacji drzewostanów. **[Dry pruning of *Pinus sylvestris*.]** *Las polski* [*Warszawa*] 29 (5), 1955 (18–20). [Pol.] From *abstr.* in *Prehl. lesn. Lit.* 6 (10), 1955 (No. 3899). [Cz.] P.R.

The author recommends that the first dry pruning, up to a height of 2·5 m., be done at 15–20 years, the second at 30–40 years. After 40 years, dry pruning should cease because of the increased danger of [*Fomes pini*?] infection. Pruning should be done with a very sharp and fine-toothed saw.

2803. KAESWURM, G. Eschenastung im Flottwedeler Allergebiet. **[Pruning Ash in the Aller region of Flottwedel.]** *Forst- u. Holzw.* 10 (16), 1955 (328–31). [G.]

Describes work done in a 21- to 25-year stand, involving ca. 700 trees/ha., and gives costs.

25. Treatment of Defective, Derelict or Very Open Stands

See Nos. 2767–8.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry (Including Shelterbelts and Their Treatment)

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

See Nos. 2927, 3529–30.

262. Fuel and Fodder Forests

See No. 2764.

264. Farm Forests

See also Nos. 3148–9, 3533.

2804. ECKMÜLLNER, O. Waldbauliche Probleme in der Oststeiermark. **[Silvicultural problems in East Styria.]** *Öst. Vjschr. Forstw.* 96 (4), 1955 (263–75). [G.]

A lecture on the problems of peasant forestry, said to be in a more hopeful state owing partly to changes in agricultural practice—e.g. mechanization—and partly to current timber prices, which make

thinnings saleable and the peasants more forest-conscious. Topics discussed include the conversion or improvement of various types of degraded or badly managed woodlands.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

See also No. 2788.

2805. **Report of the Committee on Hedgerow and Farm Timber.** H.M. Forestry Commission, London. 1955. pp. 64 + 12 photos. 31 refs.

The report of a committee appointed in 1953, with the following terms of reference: "In view of the national need to promote timber production, to examine the extent to which the growth of hedgerow timber is compatible with good agricultural practice; and to make recommendations as to the best means of securing the planting and tending of hedgerow timber." The terms of reference were later extended to cover small farm spinneys, park timber and roadside trees. The Committee's recommendations are generally in favour of increased planting and care of hedgerow trees, planting on pieces of waste land, commons etc., official propaganda and example (e.g. by land-owning public authorities), and more research on the effects of shade and shelter on crops and cattle, prevention of Dutch Elm disease etc.

2806. RICHARDSON, S. D. **Roadside forestry [in the Netherlands].** *Scot. For.* 10 (1), 1956 (31–6 + 2 photos).

266. Shelterbelts, Windbreaks

See also Nos. 2743, 2956.

2807. REIFSNYDER, W. E. **Wind profiles in a small isolated forest stand.** *For. Sci.* 1 (4), 1955 (289–97) 8 refs.

[Cf. *For. Abstr.* 16 (No. 1756).] In a rectangular plantation of 145 open-crowned *Pinus ponderosa*, 36–64 ft. high, average crown-base level 16 ft., and staggered at 20 ft. in rows 20 ft. apart, with no undergrowth, simultaneous anemometer recordings were made on a pole at 5, 16, 33, 51, 66 and 80 ft. and outside the stand at 20 ft. The profiles of winds blowing parallel with the long and short sides of the stand at points respectively 250 and 70 ft. in from the edge are separately studied and illustrated for lapse (day) and inversion (night) conditions, regression equations and lines being given for the equation $Us = a + b\ Ur$, where *Us* and *Ur* are the wind speeds in m.p.h. at the various heights and at 20 ft. in the open, respectively. Similar wind profiles of other authors drawn from similar stands of greater area and density are compared for conclusions on the conditions for developing 'infinite-stand' profiles, e.g. here tentatively suggested at 250 ft. in, under lapse conditions. In comparison with inversion conditions, wind profiles reached their full development nearer the edge for light winds (10 m.p.h.) and further from the edge at 20 m.p.h.

2808. WOODRUFF, N. P. **The spacing interval for supplemental shelterbelts.** *J. For.* 54 (2), 1956 (115–22). 7 refs. [U.S. Department of Agriculture.]

Describes wind-tunnel tests with model windbreaks having a 1-, 3-, or 7-row main belt and a 1- or 3-row supplementary at three distances. Wind profiles are drawn from Pitot-tube and alcohol-manometer readings and the areas bounded by the arbitrary levels of 50 and 75% reduced wind speed in these profiles are planimetered for an effectiveness index. These indexes are graphed against belt spacing in tree heights (H) and curves drawn for the two levels. Approximate equations are then derived from these curves and the critical maximum of the curves located by calculus. These points, in combination with the profiles, are then used to determine the approximate spacing that will maintain the greatest extent of either the 50 or the 75% wind-speed reduction between belts, the final locations being checked in the tunnel by probing with the Pitot tubes. Of those tested, a 7-row principal belt followed by a system of 1-row supplementaries would give protection to the greatest height, e.g. for tall crops, orchards, farmsteads and livestock. A 7-row principal followed by 2-row supplementaries allows the greatest distance between belts and protects the greatest length of ground. A table summarizes 'best' spacings between principal and first, and between first and second, supplementaries in the systems tested, and the equations are presented. [Cf. *For. Abstr.* 17 (No. 432).]

2809. ONODERA, S., MASUDA, H., and ISHIKAWA, M. **[On the effects of the windbreak.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 80, 1955 (53–76). 12 refs. [Jap.jap.e.] (Also in *Rep. For. Exp. Sta., Hokkaido* No. 6, 1955 (53–76).)

Gives the semi-automatically recorded data of a detailed study of wind conditions in and about windbreaks in the Tokachi District, with diagrams showing the vertical and horizontal distribution of wind speed, synoptic charts for the observation days etc.

2810. UHLIG, S. Die Auswirkungen von Windschutzhindernissen auf das Klima der bodennahen Luftschicht. **[The effect of windbreaks on the microclimate near the ground.]** *Landwirtschaftliches Jahrbuch für Bayern, München* 32 (1/2), 1955 (90–110). 13 refs. [G.] C.G.B.

Discusses, on the basis of German and Swiss literature, the influence of height, shape, and permeability on wind velocities, precipitation etc.

2811. GARJUGIN, G. A. O vlijanii lesopolos na snegovoĭ režim prilegajuščih poleĭ. **[The influence of shelterbelts on the snow regime of adjacent fields.]** *Agrobiologija* 1955 (3), (132–4). [Russ.] I.M.I.

Illustrates, from the author's experience in the Rostov region, the uneven distribution of snow to the lee of dense multi-row shelterbelts at 3–5 years of age, the snow drifting heavily near the belts but blowing away from a zone 75–175 m. wide thereafter. In the latter zone, soil freezing is more severe and the poorer moisture supply more rapidly exhausted than in the drift zone adjacent to the shelterbelts.

2812. STEUBING, L. Untersuchungen über die Konkurrenzwirkung von Gehölzwurzeln auf Ackerkulturen. Der Einfluss von Eichen als Standbäume in Hecken. **[Competition effect of tree roots on field**

crops. The influence of Oaks as hedge timber.] *Plant & Soil* 7 (1), 1955 (1–25). 19 refs. [G.g.e.] [Botanisches Institut, Potsdam-Sanssouci.]

[Cf. *For. Abstr.* 14 (No. 349).] Graphs and tables give the height growth and yield of potatoes, beet, oats, maize, and poppy sown in pairs of strips, at right angles to, and on the south wide of, an E.–W. line of 60-year *Quercus rubra*, these strips being divided into 2-m. plots over a distance of 2–24 m. from the Oak line. A strip of poppy and of oats was isolated by trenching from the Oak roots. One of each strip-pair was fertilized. The weed flora was similarly examined for height growth and number of species. Rainfall, dew, humidity, temperature, evaporation and soil temperature and moisture were measured in the plots. The occurrence and diameter of Oak roots on the vertical faces of trenches dug at 1·5, 4, 7, 10, and 12 m. from the trees is shown in a diagram. In the vicinity of the trees, air and soil temperature were only slightly reduced, rain and dew considerably. Soil humidity increased with distance from the rain-shadow and tree-root zones. All crop growth improved with distance from the trees and where isolated by trenching. Trees with spreading root systems should not be used in shelterbelts and the bad effects of existing belts could be reduced by trenching.

2813. **[Establishing plantations in the tundra.]** *Unasylva* 9 (4), 1955 (199–200).

The study of the problems of afforestation in the tundra was originally undertaken as a means of protecting the Pechora railway against snowdrifts. Methods have now been evolved which permit the establishment of a forest barrier 80 m. wide at a cost of Roubles 35,000/km. (including cost of tending for 5 years) compared with Roubles 130,000/km. for relatively impermanent and inefficient snow fences. The upper soil thaws only in summer, to a depth of 40–60 cm., air temperature in the warmest months averages only 9–10° C. and mean annual temperature is −5 or −6°. During the winter, temperatures of −55 or −50° occur. The summers are very short, and winds reach velocities of 35–40 m./sec. Soils are very poor, almost without humus, often very acid and swampy and covered with a thick layer of moss. There are isolated patches of trees and scrub (Black Birch and Willows) along the rivers and in some depressions. Observation and experiment have shown that it is essentially soil conditions and not climate that stop the forest from extending north. The first obstacle is the thick covering of moss and Birch scrub, which not only prevents the germination of seeds but above all limits the summer thawing of the soil to a very shallow depth. In places where the soil had been cleared during work on the railway, natural regeneration of trees or bushes took place, the rate of growth of young trees (Birch, Willow, Fir, Juniper) is satisfactory, and their terminal buds appear to be unaffected by frost. The methods now used include mechanical clearing of moss and Black Birch scrub, planting on mechanically raised mounds, liming and fertilizing. The effects of wind are reduced by planting and sowing between strips of untouched moss and Birch or in the shelter of rows of Willow or Birch previously established. In the spring of 1954 work had reached as far north as Piesietz, where a barrier of 40 rows of trees has been established on a relatively favourable clayey-siliceous soil which, when work began on 16 June, had thawed to a depth of only 30 cm. After cultivation, sowing and planting of Fir, Willow, Larch, Birch, Hawthorn etc. were carried out on 19 June. By 8 Aug. it was found that thawing of the soil, which had hardly increased on unworked land had reached a depth of 2 m. on cultivated land, and by autumn it had reached 3 m. Plant survival, except with Larch, was 80–90% and satisfactory germination was obtained in 2 weeks.

2814. LENARD, A. Kulture eukaliptusa—zaštita protiv vetra i sredstvo za povećanje žetvenog prinosa. **[Eucalypt plantations as a protection from wind and a means of increasing crop yields.]** *Šumarstvo* 8 (9), 1955 (564–70). [Croat.croat.e.f.]

Advocates the introduction of Eucalypts, particularly *E. rostrata* and *E. globulus*, along the Adriatic coast.

2815. MATSUI, Z. and SHINOHARA, H. **[On the management of windbreaks in Tokachi District.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 80, 1955 (77–99). 8 refs. [Jap.e.] (Also in *Rep. For. Exp. Sta., Hokkaido* No. 6, 1955 (77–99).)

In the Tokachi District, windbreaks for the protection of crops from *föhn-* and *bora*-like winds consist of natural Kashiwa Oak [*Quercus dentata*], 27- to 35-year Larch (*Larix leptolepis* and *L. dahurica*), and Larch planted in 1–6 lines. Data, based on stem analyses and stand composition, are given for the size, stems/ha. and volume m.a.i. of the Oak and Larch at 30 years, showing that the Larches produce 3 to 4 times the volume of the Oak. The Oak should be replaced with Larch and the latter regenerated by strip cutting on a 10-year cycle or underplanted with Todo Fir [*Abies mayriana*]. Details are given of the yield of a 2-line Larch windbreak and suggestions for its management as an uneven-aged crop; the windbreaks produce timber revenue and may raise field crop yields by 20%.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 2927, 2932, 2937–40.

2816. Parcours et pacages forestiers. **[Forest grazing.]** *Sols Africains, Paris* 3 (3), 1955 (417–21). [F.E.]

Gives the conclusions of 50 foresters, representing 26 governments at the FAO meeting in Rome (April 1954), on general policy, technical aspects and administration, research and education, and on ways (including F.A.O. assistance) of implementing policy. [Cf. *For. Abstr.* 15 (No. 3586).]

2817. ALPAY, O. Yabancı çayır ve mer'a bitkileri adaptasyon denemeleri hakkında ara rapor. **[Trials of exotic forest [forage] species.]** *Bolu Orm. Araşt. Istasyon Müd. tek. Bült.* No. 2, 1954, pp. 23 + 2 gphs. 7 refs. [Turk.e.]

A first season's report on trials (1953–54) by the Bolu Forest Experimental Station of 27 grasses and 13 legumes (including *Pueraria thunbergiana*) hand-sown at 3 depths on the site of a former log dump, after heavy cultivation of the compacted soil. The generally poor initial results of the first sowings, given in detail, are attributed chiefly to the late date (9th May).

2818. CORNELIUS, D. R., and TALBOT, M. W. **Rangeland improvement through seeding and weed control on east slope Sierra Nevada and on Southern Cascade Mountains.** *Agric. Handb. U.S. Dep. Agric.* No. 88, 1955. pp. 51. 14 refs.

Includes short sections on sowing grass seed in Pine, Aspen, and Red Fir [*Abies magnifica*] types.

2819. LAVIN, F., and SPRINGFIELD, H. W. **Seeding in the Southwestern Pine zone for forage improvement and soil protection.** *Agric. Handb. U.S. Dep. Agric.* No. 89, 1955. pp. 52. 46 refs.

2820. GLENDENING, G. E., and PAULSEN, H. A. **Reproduction and establishment of Velvet Mesquite [*Prosopis juliflora* var. *velutina*] as related to invasion of semidesert grasslands.** *Tech. Bull. U.S. Dep. Agric.* No. 1127, 1955. pp. 50. 52 refs.

Data from a 5-year investigation of some of the factors affecting reproduction and establishment of Velvet Mesquite in southern Arizona, coupled with the recorded observations of early investigators and travellers through the region, show that this undesirable leguminous tree or shrub is well adapted for further spread into adjacent grassland areas within its climatic tolerance. The important characteristics of Mesquite that favour the initial establishment of the seedlings are: (1) abundance of seeds of high viability and extreme longevity, which are eaten and disseminated by native and domestic animals; (2) high germinative energy under a wide range of temperature and moisture conditions; (3) rapid development of roots as compared with tops, and a marked degree of physiological resistance to drought; and (4) capacity of young plants to sprout and thus regenerate themselves following injury to the tops. Experimental evidence showed that competition by native perennial grasses markedly reduced Mesquite seedling establishment and indicates that grazing practices which will allow maximum development of grass stands and also minimize seed dissemination, may be expected to reduce the rate of spread of Mesquite into the remaining uninfested grasslands. In marked contrast, on areas where Mesquite trees of seed-bearing size were present at time of fencing, grass cover has declined and Mesquite have become established at a steady rate, thus showing that Mesquite will continue to increase on such areas unless artificial control measures are applied. In controlled-burning tests, young seedlings were found to be killed by burning during late spring, indicating that fire may have been of some importance in holding Mesquite in check prior to settlement of the Southwest. *Authors' summary.*

28. Husbandry of Forest Products Other than Wood

See also section 892.

282. Bark Crops

2821. GOIS, E. DA S. REIS. A arborização dos terrenos ao sul do Tejo com sobreiros. [**Afforestation of the region south of the Tagus with Cork Oak.**] *Bol. Junta nac. Cortiça, Lisboa* 18 (205), 1955 (7–10, iii–v, 6–8). [Port.E.F.]

Notes on the extension and improvement of Cork Oak stands in this region, and on some of the sowing and planting methods used.

284. Crops Tapped for Exudations

See also No. 2684.

2822. ŠTANAGEĬ, V. G. Usoveršenstvovatj podsočnyĭ instrument. [**The tapping tool should be improved.**] *Gidrol. lesohim. Prom.* 8 (7), 1955 (23). [Russ.] P.R.

Criticism of the MT-3 tapping tool (invented by Timofeev) which is the standard tool used in the U.S.S.R. since 1950.

2823. CLEMENTS, R. W. **Double-headed nails for attaching naval stores tins.** *Naval Stores Rev.* 65 (10), 1956 (15). [Southeastern Forest Experiment Station.]

Presents a diagram with specifications of a double-headed nail developed in 1951 by the Lake City Research Centre, and now produced commercially by several manufacturers.

2824. KOMAROVSKIĬ, V. N. Metod nepreryvnogo himičeskogo vozdeĭstvija v podsočke. [**Method of continuous chemical stimulation in resin tapping.**] *Gidrol. lesohim. Prom.* 8 (7), 1955 (10–1). [Russ. russ.] P.R.

Tests conducted in the U.S.S.R. since 1951 have shown that continuous stimulation of tapping faces with minute doses of the chemical stimulant gives encouraging results. Three types of dispenser are illustrated and described. It was found that 0·5% H_2SO_4 or 2% HCl were effective as continuous stimulants, the resin flow being in both cases more than twice as great as in the controls; a similar increase was obtained by using a 1/6 solution of chlorinated lime. Continuous stimulation with [pure?] water alone gave an increase of 15–20%; and with 1% solutions of NaCl, Na_2SO_4 or sucrose, increases of ca. 100%. Preliminary results of micro-doses of various elements e.g. Zn, Cu, B were encouraging.

2825. TOLKAČEV, A. K., and SINELOBOV, M. A. Zavisimostj vyhoda živicy ot vysoty raspoloženija karr na stvole sosny. [**Dependence of resin yield on the height of the faces on the Pine stem.**] *Gidrol. lesohim. Prom.* 8 (8), 1955 (12–3). 1 ref. [Russ.] P.R.

Discusses tests made by the authors in 1953 on 50 trees, 80–100 years old, mean d.b.h. 29 cm., in an almost pure stand, site quality II, density 0·7, from 20 May to 25 Sept. Four half-faces, 12 cm. wide, were cut helically on each stem at heights of 0·5, 2·1,

3·7 and 5·2 m., by freshenings 0·7–0·8 cm. wide and 0·7 cm. deep, every 3·5 days on the descending method, using the MT-3 tool. Results of these and of Putjatyckil's experiments in 1939–40 show that the resin yield for the tapping period falls by 3–4% for every metre of height up the stem. The authors correlate this finding with the reduction of sapwood thickness with height. Owing, however, to temperature differences, this yield relationship may be reversed in the spring, i.e. the yield may increase with height.

2826. KAPUŚCINSKI, S. Zwalczanie szkodników wtórnych oraz czynności zapobiegawcze w drzewostanach sosnowych przewidzianych do żywicowania. **[Control of secondary pests and preventive measures in Pine stands earmarked for tapping [in Poland].]** *Las polski* [, *Warszawa*] 29 (5), 1955 (20–3). [Pol.] From *abstr.* in *Prehl. lesn. Lit.* 6 (10), 1955 (No. 3951). [Cz.] P.R.

The most frequent cause of insect attack in *Pinus sylvestris* stands is the raising of the water-table. This is particularly true for *Hylobius abietis*, *Pissodes pini* and *Phaenops cyanea*. The removal of stumps reduces the danger of *Armillaria mellea*.

2827. SCHOPMEYER, C. S. **Gum yield and wood volume on single-faced naval stores trees.** *Sth. Lumberm.* 191 (2393), 1955 (123–4). [Southeastern Forest Experiment Station.]

Compares the expected annual loss through reduced increment of sawlogs and pulpwood from tapped Slash Pine with the value of their resin yields, on the basis of an investigation in a Florida plantation and local yield tables. Where resin yields exceed 10 lb./tree there is a good margin for profit, but the greater susceptibility of tapped trees to turpentine-beetle attack should be considered in danger areas. [Cf. *For. Abstr.* 17 (No. 454).]

2828. SOEPARDI, R. *Pinus merkusii* ditanah Gajo. **[*P. merkusii* in the Gajo lands [Central Atjeh].]** *Rimba Indonesia* 4 (6/8), 1955 (265–79). [Jav.e.]

Distribution and occurrence in plantations, regeneration, botanical description, description of the wood, products, methods of resin tapping, yields and properties of the resin. *From author's summary.*

2829. ANDERSON, A. B. **Extract stimulation for wood rosin production—increasing the extractive content in Ponderosa Pine.** *For. Prod. J.* 5 (6), 1955 (417–20). 17 refs.

[See also *For. Abstr.* 8 (No. 1285); 10 (No. 615); 11 (No. 1354).] Continuous incisions were made across ¼ to ⅓ of the circumference, about 16 in. above ground and ca. 4 in. deep beyond the cambium, in 4 *Pinus ponderosa* trees of 21–28 in. d.b.h., growing at 4500 ft. in a mixed *P. jeffreyi* stand. The wounds on 2 stems were filled with 40% H_2SO_4. Five and 12 months after incising, borings 4 in. deep were taken from each tree at different levels above and below the wound (12 in. each way). The average content of acetone-soluble extractives for the whole interval of 24 in. was: (1) in acid-treated stems 17·8% after 5, and 18·9% after 12 months; (2) in the untreated, 8·7% and 9·4%. The extracts approached in amount that found in the butt heartwood of old-growth Pine and their dominant constituents were resin acids, volatile terpenes and esters. A comparative analysis of both sap- and heartwood showed that the dominant extractive-constituent change in the sapwood-into-heartwood transition is an increase in volatile terpenes, resin acids and phenolics; the stimulated extracts were found to have nearly the same chemical composition as the extract from heartwood.

2830. ANDERSON, A. B. **Increasing extractive content in trees for rosin production. Extract stimulation of Jeffrey Pine.** *Tappi* 39 (1), 1956 (55–9). 19 refs. P.R.

[Cf. *For. Abstr.* 17 (No. 456).] Investigations on 3 *P. jeffreyi* trees by the same method as in the paper quoted yielded analogous results. It is suggested that young trees can be made to produce sufficient concentrations of resin prior to felling.

286. Osier-Growing

See also Nos. 3437–8.

2831. LONGCHAMP, R., and GAUTHERET, R.-J. Recherches sur l'inhibition du développement de l'osier par l'hydrazide maléique et l'acide naphtalène-acétique. **[Inhibiting growth of Osiers by means of maleic hydrazide and naphthalene-acetic acid.]** *Rev. gén. Bot.* No. 742, 1955 (689–707). 9 refs. [F.f.] O.B.D.

Experiments were made on *Salix viminalis*, *S. purpurea* and *S. fragilis* in order to discover a treatment that would inhibit growth in length and diameter of Osiers without affecting their flexibility. Shoots were accordingly sprayed with (1) naphthalene-acetic acid (0·005 to 1% free acid), and (2) maleic hydrazide (0·03–3% free hydrazide) on 8 May, 5 June, 27 June, and 7 August respectively. Less than 0·1% of maleic hydrazide produced no effect at all, whereas slight growth inhibition could be obtained with only 0·005% naphthalene-acetic acid. The latter proved a powerful growth inhibitor, but is liable to produce considerable malformation of shoots, and its use is not recommended. Maleic hydrazide in heavier concentrations, however, gave promising results. It is best used late in the season when the shoots have attained commercial size. A concentration of 1% for *S. viminalis* and 3% for *S. purpurea* and *S. fragilis* is recommended.

288. Crops Grown for Animal Products

2832. ROTERT. Die Bienenweide im Walde, in Feldgehölzen und Hecken. **[Bee pasture in forests, copses and hedges.]** *Forst- u. Holzw.* 10 (15), 1955 (311–2). [G.]

A plea to consider the bees when choosing trees or shrubs for planting, modern weedkillers having greatly reduced their sources of food. A list of suitable species is given, including Willows for early pasture.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

2833. ARO, P. **A new scheme for greater uniformity in the classification of work and working time in forestry time studies.** *Commun. Inst. for. Fenn.* 44 (7), 1955. pp. 38. [Fi.Sw.G.E.]

Proposes a standard method of breaking down working time.

302. Man and Work (Physiology and Psychology)

See also Nos. 2746, 2858.

2834. HANSSON, J.-E., SUNDBERG, U., and LUNDGREN, N. Snöskor vid skogsarbete: en preliminär undersökning över deras användning. [**Snowshoes for forest work: a preliminary study on their use.**] *Skogen* 43 (2), 1956 (26–9). 3 refs. [Sw.sw.]

Seven types of snow-shoe, made of metal strips (iron or aluminium) or of aluminium or veneer in sheet form, were tested. In the walking tests, speed of travel and pulse-rate after a fixed distance had been covered were measured, but in tests of snow-shoes for felling and skidding practical observations were made without direct measurements. For walking, larger snow-shoes gave best results; the aluminium-sheet ski-type shoe was quite unsuitable. For felling and skidding a small snow-shoe is necessary to allow for working in the pit dug in the snow round the tree to be felled and for moving among the branches after felling; the snow-shoe should be fastened firmly at the heel to allow for quick backward movements. Graphs of the results and photographs illustrating the types of snow-shoe and work with and without snow-shoes have English legends.

2835. KAMINSKY, G. Untersuchungen beim Holztransport mit Schlitten im winterlichen Hochgebirge. [**Studies [on the physiology of human exertion] in timber transport by sledges [descending by gravity and dragged or carried back up-slope] in the high mountains in winter.**] *Repr.* from *Arbeitsphysiologie* 15, 1953 (47–56). 5 refs. [G.g.]

Gives the results of time, energy-consumption and pulse-frequency studies made in Austria on skilled Tyroleans engaged in this work. Energy consumption and pulse rates were extremely high, the average for the former during the working day being 5·6 Kcal./min. The total consumption per 24 hours is given at 6538 Kcal. This is above the limit usually quoted as possible (in sustained work) without danger to health, and study is needed of possible pathological effects.

305. Sequence of Work and Performance (Time and Performance Tables, Evaluation of Work)

See Nos. 2789–91, 3310.

306. Conditions affecting Work (Climate, Site, Stand etc.)

See No. 2789.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 2693–5, 2778, 2789, 2822–3, 2903–4, 2920–5.

2836. BROUHIER, A. Journée de démonstration de petit matériel et engins forestiers, Forêt de Soignes, le 12 octobre 1955. [**Demonstration of forest machinery and equipment, Forest of Soignes, 12 Oct. 1955.**] *Bull. Soc. for. Belg.* 63 (3), 1956 (97–123 + 13 photos.) [F.]

Includes descriptions, with photographs of the apparatus in use, of the Stabru telescopic ladder, the Wiesel and Attila mechanical brushcutters and 3 mechanized hedge-trimmers (the Shearomatic, Teagle, and Clippgears).

2837. Informations sur le matériel. [**Notes on equipment.**] *Bois For. Trop.* No. 45, 1956 (79–82). [F.]

Notes, with illustrations, on the following: The Tripode P.H.I. Type 5, a lifter capable of lifting trees of up to 24 cm. g.b.h. in 2–3 minutes. The Fondeur subsoiler. The Contrôlograph, a meter that can be installed in lorries or tractors, and registers (1) the time during which the vehicle is moving and, in certain conditions, the time during which the engine is running, (2) the distance travelled and average speed, (3) the speed at any moment, and (4) any attempts at tampering with the record disc; the apparatus is made in 3 models, costing respectively Fr.50,000, Fr. 40,000, and Fr. 25,000 (Maison Degiorgi, Ste. Claude, Jura.).

2838. **Equipment news.** *Unasylva* 9 (4), 1955 (191–3).

Descriptive notes with photographs of the following among others: Letourneau logging arch with electric drive aid for steep gradients (Le Tourneau-Westinghouse Co., Peoria, Ill., U.S.A.); Homelite Model 17 chain saw with spike attachment to keep the chain off the ground and prevent logs from rolling (Homelite Corporation, Port Chester, N.Y., U.S.A.); No. 3 Jumbo portable sawmill (Frick Co. Inc., Waynesboro, Pa., U.S.A.); and several tractors and wood-working machines.

2839. KNIGGE. Schlepperbetrieb in der Forstwirtschaft. [**The use of tractors in forestry.**] *Forst- u. Holzw.* 10 (14), 1955 (293–4). [G.]

Short descriptions with illustrations, of German forestry implements for use with wheeled tractors, including winches, a plant hole borer, a grader, ploughs, and a circular saw.

2840. LOYCKE, H. J. Forstwirtschaft und Mechanisierung. [**Mechanization in forestry.**] *Forst- u. Holzw.* 9 (24) 1954 (501–3); 10 (1), 1955 (6–8). [G.]

A lecture in general terms on the degree of mechanization technically and economically possible or advisable, the organizational and social problems involved etc. A few German tractors, e.g.

the 4-wheeled MAN and 'Stier' tractors (the former with a winch), ca. 24–48 h.p., the Hanomag crawler tractors K55 and K90 and the 90 h.p. Demag crawler, and mechanical hoes etc., e.g. the Wiesel F.600, are mentioned.

31. Logging and Transport: General

See also Nos. 2366, 2524, 3155–6, 3304–5.

2841. BULBOACĂ, I. Metode noi de lucru in exploatările de păduri. [**New methods of work in forest exploitation.**] Editura Confederației Generale a Muncii [, Bucharest?] 1951. pp. 76. [Rum.] Price *Lei* 80.

A simple manual on planning, mechanization, and lay-out of logging operations, with particular reference to Russian methods.

2842. GIORDANO, G. Della possibilità e convenienza di razionalizzare le utilizzazioni boschive e le altre lavorazioni forestali. [**The possibility and advantages of rationalizing logging and other forest operations [in Italy].**] *Ann. Accad. ital Sci. for.* 2, 1954 (51–72). [It.f.]

2843. PUTKISTO, K. **On the mechanisation of timber preparation and forest haulage.** *Finnish Paper and Timber, Helsinki* 6 (7), 1955 (103–6). [E.]

An account of conditions in Finland, with estimates of savings in time and costs over manual work, and calculations of the relation between profitability and the amount of wood to be handled.

2844. SHILLINGLAW, A. W. **Regeneration felling introduced in Victoria.** *Aust. Timb. J.* 21 (11), 1955 (1027–8, 1098 . . . 1105).

In Victoria the State Commission holds about 9000 sq. miles of mixed Eucalypt forest, which has been cut over 1–6 times. The chief objects now are to obtain regeneration and to complete the utilization in these areas. Under the newly introduced system all stems are felled except seed trees and young growing stock, the marking rules requiring the retention of all sound young trees that have room to develop and of special seed trees where regeneration is wanting. Loggers fell first all trees likely to yield a log, cut out the logs and extract them. Then all culls are felled and left to rot on the ground, care being taken not to block the main extraction routes, which also provide access for fire protection and for the thinning due in 25 years. The increased fire hazard is dealt with by strip burning. Marking and felling are demonstrated first in 5- to 10-acre pilot areas to show Commission officers and millers the method, and its local costs and yields. Where there is no yield, Commission labour (on contract) is used, any odd logs won being sold to mills. Where a half or less of logging time is required to deal with culls, the balance being available for the winning of millable logs, the whole operation may be carried out by millers' loggers and the mills reimbursed for the cost of felling culls plus 10·5% for workmen's accident insurance. All such work is paid on a sliding scale per foot of felling (or cross-cut) girth, e.g. for girths 0–2, 2–3, 3–4 ft., 6, 7, and 8d./ft. respectively. The merits of the system are discussed. Among the advantages are the assurance of regeneration, more revenue and more timber. For the millers there is relief from felling unmillable timber (in poor stands 4–5 trees are sometimes felled before a sound one is found); there is a new lease of life for many mills and a prospect of stability to cover the interval during which the *E. regnans* regenerating from the 1939 burns will mature; and there is more regular employment for mill labour. The method should be applied not only to cut-over stands but also to virgin forest, so as to bring all up to fullest production.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

See also Nos. 2889–90, 3383, 3479.

2845. MARINKOVIĆ, B. Da li je ispravno određeno vrijeme sječa u mediteranskoj oblasti Dalmacije? [**Has the felling season in the Mediterranean zone of Dalmatia been properly determined?**] *Šum. List* 79 (9/10), 1955 (308–14). 7 refs. [Croat. croat.f.]

It is argued that, owing to the existence of two growth periods, it is better to fell in December–February and from mid-August to mid-September than, as heretofore, from October 1 to March 31.

2846. HARZMANN, L. Zur Frage der Trocknung des Holzes durch Kronenbelassung nach dem Hieb. [**The effect of retaining the crown on the drying of the felled tree.**] *Arch. Forstw.* 4 (2/3), 1955 (232–40). 19 refs. [G.] [Institut für Forstnutzung, Eberswalde.]

[Cf. *For. Abstr.* 16 (No. 364).] Reviews the conflicting results of former work and describes a statistically evaluated pilot test carried out on Spruce, Pine and Beech felled in March–June 1954, at various places in E. Germany. At most of these places the drying of the felled tree was faster without than with the crown, and exceptions to this were almost all not statistically significant. Differences in these findings from those in the Soviet Union may be due, it is suggested, to differences in climatic conditions and wood properties.

2847. BEEBE, C. W., ROGERS, J. S., LUVISI, F. P., and KOEPP, W. H. **Sodium arsenite as a debarking agent for Hemlock trees causes serious loss of tannin in the bark.** *For. Prod. J.* 6 (1), 1956 (38–40). 4 refs.

Results of an investigation show that Na arsenite used as a barking agent for *Tsuga canadensis* causes a loss of ca. 30% of bark tannin, the effect being distributed throughout the height of the tree. *From authors' summary.*

2848. BUCHHOLZ, E. Trockentränkung lebender Bäume in der Sowjetunion. [**'Dry impregnation' of living trees in the U.S.S.R.**] *Holz-Zbl.* 82 (22), 1956 (290). [G.]

A report on the work of P. G. Krotkevič, P. Molotkov and others. The chemicals were inserted in holes 34–45 mm. wide, bored with a downward slope from the root collar on standing trees. Non-hygroscopic salts sometimes needed the addition of, e.g. NaCl, and could only be applied at the time

of sap-rising or on very moist soil. Species that 'bleed' heavily in spring should be treated in summer or autumn. Absorption is rapid at the start but soon slows down. Fe salts introduced into Oak, Beech, Alder etc., were absorbed in 2–3 days. They reach the tree tops in 5–10 days and penetrate deeply into the roots. Tangential and radial penetration is much less and much slower. Damaged, e.g. rotted or split, parts are not penetrated. Dyes rise only 2–5 m. Absorption in conifers takes place in the sapwood, from the cambium inwards; in hardwoods it starts from the centre, penetrating outwards. But in Oaks, Beech, and Ash, with red or false heart, the salts are absorbed by the sapwood only. It is stated that the method has been used for the dyeing of standing trees [cf. *For. Abstr.* 12 (No. 557); 14, (p. 516)], for impregnation against fungal attack, fire-proofing of standing timber and also nutrition.

2849. NAUMANN, B. Das Absprengen von Wipfeln. **[The blasting of tree tops.]** *Wald* 3 (1), 1953 (13–4). [G.]

Describes a method of blasting off the crowns of standards to avoid major felling injuries to growing stock, including the equipment needed and the amounts of explosive required for various crown-base diameters. Also a safer method patented by Langer, using a special explosive and a device for detonating the charge from the ground.

323. Felling and Subsequent Primary Conversion

2850. SZABÓ, G. Csörlös irányítás-döntésnél. **[Controlled tree felling by means of a winch.]** *Erdö* 4 (2), 1955 (78–9). [Hu.]

One end of a 40- to 45-m.-long steel cable is fastened (as illustrated) to the tree to be felled at about 8–10 m. height and the other end passed, via one block of a double pulley, to a winch attached to a trunk near by. The two ends of a shorter cable passing through the other block of the pulley are attached to two trees on the front side of the tree being felled. In trials using a motor saw in conjunction with this equipment, in an 80-year-old Beech stand on a steep snow-covered slope, only 2 out of 180 stems failed to fall in the desired direction, and none of them split. The method, requiring 4 workers, has proved rather quicker than uncontrolled felling and produces higher yields of marketable timber.

325. Sorting and Assortments of Wood in the Rough

2851. GUILKEY, P. C. **Short bolts offer better hardwood utilization.** *Tech. Note Lake St. For. Exp. Sta.* No. 446, 1956. pp. 2.

Cutting Beech into 52-in. bolts (minimum top diam. u.b. 7 in.), instead of standard logs 8 ft. or more long to a minimum top diam. of 8 in., gave an increase of 585 bd. ft., almost entirely from relatively clear sections that were too short for standard logs. Similar results have since been obtained from 2 commercial operators.

326. Sequence of Operations (Including Felling Instructions, Primary Conversion after Extraction, Composition of Gangs, One-Man Work etc.)

See also No. 2791.

2852. IRMISCHER, F. Einmannarbeit im Hauungsbetrieb. **[One-man work in logging.]** *Forst- u. Holzw.* 9 (18), 1954 (376–9). 5 refs. [G.]

One-man work proved more productive, though also more strenuous, per hour worked, than two-man work, in logging Spruce and Beech (> 350 stems) with d.b.h. varying from 8 to 29 cm. The advantage was greater in Spruce, where even in felling trees with a d.b.h. of 16–18 cm., one man took less than twice the time of two. For reasons of general psychology and of mutual help in difficulties and accidents, however, at least two workers should always work near each other.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood

See also Nos. 2844, 3240.

2853. LUTHARDT, W. Biologische Stubbenrodung. **[Biological stump disposal.]** *Wald* 2 (10), 1952 (294–7). 2 refs. [G.g.]

Describes the experimental inoculation of stumps with saprophytic fungi for the purpose of (*a*) accelerating decomposition (said to take from 4 to 12 years), (*b*) growing fungi for food, or (*c*) converting their wood into a very light and easily worked substance, including controlled laboratory decay tests. Of the fungi used, *Pholiota mutabilis* was truly saprophytic, whereas *Pleurotus ostreatus* also attacked living wood. [Cf. *For. Abstr.* 17 (p. 141).]

2854. WILLIAMS, D. E. **Fire hazard resulting from Jack Pine slash.** *Tech. Note For. Br. Can.* No. 22, 1955. pp. 17. 7 refs.

A report of a study in S.E. Manitoba. A number of sample plots of *Pinus banksiana* were burned in cut-over areas where the method of slash disposal had been: (1) left as cut, (2) piled and left unburned, (3) piled and burned, (4) tops only left, and (5) lopped and scattered. For comparison, two additional plots were established in (6) typical uncut Jack Pine. It was found that fire hazard in (3) was about one-third of that in (1), (2), (4), and (5), between which there were no significant differences, and was comparable to that in (6). Unburned slash constitutes a relatively high fire hazard for at least 10 years after the cut.

2855. JOHNSON, H. J. **The effect of various slash disposal methods on the regeneration of cut-over Jack Pine stands.** *Tech. Note For. Br. Can.* No. 23, 1955. pp. 11. 2 refs.

All methods of slash disposal studied [cf. preceding abstract] resulted in unsatisfactory regeneration. Piling was the only method used from which anything approaching acceptable stocking resulted, but it creates a high fire hazard. It is clearly indicated that the method of slash disposal is not the only factor influencing the regeneration of *Pinus banksiana* on cut-over areas. Some method of ground preparation or artificial regeneration in conjunction

with the least hazardous method of slash disposal, may be the best solution of the problem.

34. Storage in the Forest and at Log Dumps

2856. TUOVINEN, A. Halkojen aumauksesta. **[Shelters for storing fuelwood.]** *Tied., Metsäteho, Helsinki* No. 116, 1955. pp. 10. [Fi.e.]

Time studies were made on the construction of 6 types of shelter (illustrated) consisting of 3 or 4 log stacks raised to the height needed to support the roof, this being of ordinary fuelwood logs. The logs to be stored and used in constructing the shelter were 1 m. long, split or partly barked in strips. Tabulated figures of the time taken to construct the shelters, broken down for the different operations, show that 23·7–45·2% of the time is spent on raising the piles to the height needed to support the roof, and 54·8–76·3% on the roof itself. The wood used to raise the stacks and build the roof was taken from temporary stacks 1·3 or 2m. high, one at each side of the main stacks. Tables are given showing the time taken in relation to the amount of timber handled (i.e. that from the temporary stacks) and the total amount of stacked timber. The construction of ventilation holes added considerably to the construction time, taking 10·38 min./hole.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 2790–1, 2852.

2857. STEINLIN, H. Zur Methodik von Feldversuchen im Hauungsbetrieb. **[Methods of field study in logging operations.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 31 (2), 1955 (249–320). 60 refs. [G.g.f.]

Discusses in detail, with examples, some of the difficulties involved in work studies in the field, and the particular dangers of bias in e.g. choice of trees and felling sites and idiosyncrasies of individual workers.

2858. GLÄSER, H. Untersuchungen über Holzhauerarbeit am Steilhang. **[Studies of logging work on steep slopes.]** *Repr.* from *Forstliche Arbeitslehre und Menschenführung, Wien & München* 1954 (56–9). 6 refs. [G.]

Briefly describes time studies on the felling and trimming, extraction [by manual dragging?] to an average distance of 135 m., and cutting up (usually done on flatter ground, after extraction) of poor Beech, mostly of coppice origin, on slopes with gradients up to 90%, in the Weilheim and Wiesensteig forest districts. The studies covered 10–11 days' work by two 2-man gangs. Times are expressed per 1 cu.m. outturn (solid or stacked) for the several assortments (timber logs, split or unsplit cordwood), for extraction, and for the individual jobs in felling and trimming. Ascertained times are multiplied by figures (from literature and the author's own studies) for energy expenditure, and a graphical comparison is made of the distribution of time over, and energy expended in, the various phases of the work. [Cf. *For. Abstr.* 15 (No. 310).]

2859. OLSEN, H. C. Undersøgelse vedrørende afbarkning af bøgeknippel. **[Study on barking Beech billets.]** *Dansk Skovforen. Tidsskr.* 40 (8), 1955 (355–62). [Dan.]

Results of time studies on barking of billets 8–15 cm. in diam. are analysed statistically and tabulated to show the time taken per stacked cu.m. for number of pieces per stacked cu.m. ranging from 40 to 100 and for different volumes (solid measure) before barking.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 2836, 2838, 2839, 2850, 3285.

2860. **Cambio debarking machine.** *For. Equipm. Note FAO* No. *D.* 9.55, 1955. pp. 1.

Description and specifications of barking machines (4 sizes) manufactured by Söderhamns Verkstäder A.B., Söderhamn, Sweden.

2861. **New mechanical debarker uses cambium shear principle.** *Paper Tr. J.* 140 (12), 1956 (38, 40). P.R.

A summary of existing data on the Swedish-designed Cambio Debarker (derived from APA Releases Nos. 252 and 253, available from the American Pulpwood Ass.). Its essential mechanism is 5 self-adjusting scrapers with thick rubber tension bands, which require no operator.

2862. LEVANTO, S. Teräskaarisahojen lujuus tutkimusten valossa. **[The durability of steel bow saws in the light of research.]** *Teho, Helsinki* 1955 (10/11; 12), (660–7, 731, 732; 792–8, 800, 801). [Fi.sw.e.]

Compares some Finnish and foreign makes and steel versus wooden bows. Strength of the latter largely depends on species, but is on average double that of steel bows, which lack elasticity. *From author's summary.*

2863. MCKENZIE, W. M. **The performance of gouge type power saw chains.** *Aust. Timb. J.* 21 (10), 1955 (938 . . . 954, 995). 2 refs. [Division of Forest Products, C.S.I.R.O., Melbourne.]

Bench and field tests on sections and logs of 2 Eucalypts, 2 Pines, and Douglas Fir lead to the following conclusions: In these chains, uniformity in heights of teeth and in depth gauge clearance is important for accurate cutting. The type can be designed and sharpened to perform as well as or better than 'scratch' [normal tooth] chains. Increasing the front bevel angle from 15° to 45° greatly reduces rate of cutting but also greatly reduces power demand, permitting the former to be restored by other measures. Within engine capacity, rate of cutting can be increased by increased loading of the cutter bar; this load becomes less effective after tooth bite has exceeded depth gauge clearance, the optimum value for the latter being fairly easily predictable. Reduction of the sharpness angle of the top cutting edge increases cutting rate and power demand, the degree to which this occurs being limited by the quality of the steel and hardness of the wood. The rate of blunting appears to be greater in gouge than in scratch chains but their

easier sharpening offsets this. The resulting shorter life and greater replacement costs suggest that the use of high-grade steel is more important in them.

2864. CARPELAN, G. **The economics of the one-man power saw.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2629, [1955?] pp. 57 + 5 photos + 11 gphs. + 2 tbls. 40 refs. Transl. by H. E. Kijlstra from *Norrlands SkogsvFörb. Tidskr.* 1953 (4), (499–576). [See *For. Abstr.* 15 (No. 2566).] Limited distribution.

2865. HUNT, B. H. **Portable fire extinguisher for mechanical saw operator.** *Pulp Paper Mag. Can.* 57 (2), 1956 (91). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1544 (*B–7–c*).)

The extinguisher consists of a double bag containing 1¾ lb. of dry chemical [unspecified], enough to deal with a 2½-ft. diam. fire. The cost is $1·18.

2866. Eine elektrische Axt. **[An electric 'axe'.]** *Wald* 2 (9), 1952 (287). [G.]

Briefly describes [without mechanical details] the Russian 'BET' branch trimmer, designed by Bogatyrev. The device consists of a housing containing an electric motor and a striker mechanism which causes the actual cutting tool to deliver 4000–5000 blows/min. The cutting tool has the shape of a fish-tail, with the cutting edge along its forked end so that it fits round and centres itself automatically upon the branch to be cut. It is set at an angle to the striker mechanism, enabling branches to be trimmed almost flush with the stem. Branches on the underside of the stem can be cut without turning the latter. The cutting tool can be changed to suit the species of tree concerned. The original model weighs 9·5 kg., but the author is attempting to devise a model weighing ca. 6 kg.

2867. EVERS, E. Résultat de l'enquête sur les machettes. **[Conclusions of an enquiry on machetes.]** *Bull. Inform. Inst. nat. Étude agron. Congo belge* 5 (1), 1956 (49–56). [F.]

From 562 preferences selected from 8 models by estate labourers, the ideal machete should be 580 mm. long with a 450-mm. blade, the back forming one straight line with the handle, and the latter should be replaceable from spares and have a foot for secure grip. The blade should be 45 mm. broad at the handle, widening to 50 mm. at the most used section, and sharp from the handle round the rounded tip and about one third of the back. The weight should be 650 g.

2868. **The Hydro Sky-Worker.** *For. Equipm. Note FAO* No. *A*.6.55, 1955. pp. 2.

Description and specifications of the Hydro Sky-Worker, manufactured by the Tey Manufacturing Corporation, Milford, Conn. It is a hydraulically operated boom for carrying workers up to any required level (up to 42 ft.) and maintaining them there on a steady work base. It can be used for seed collection, pruning, trimming etc., and rotates on a turret that can be mounted on any half-ton or larger lorry, trailer, or tractor.

37. Transport

371. Loading and Unloading

2869. KANTOLA, M. Kuorellisten havusahatukkien kuormaus maavarastoista autoon Record-puominosturia käyttäen: talvikuormaus keskinkertaisissa olosuhteissa. **[Loading unbarked coniferous sawlogs from ground storage on to a lorry with the Record boom crane: winter loading in average conditions.]** *Julkaisu, Työtehoseura, Helsinki* No. 71, 1954. pp. 94. 62 refs. [Fi.e.]

Discusses the main factors affecting loading time: (1) Each 25-cu.-ft. increase in load size, loading logs of 4–7 cu. ft., causes an increase of 2–4 min. in loading time. (2) Increases in mean volume of the logs from 4 to 5 or from 6 to 7 cu. ft. cause decreases of 8–10 and 4–5 min. respectively for loads > 300 cu. ft. and of 6–7 and 2–3 min. for smaller loads. (3) Actual loading time (y) varies with different load and log sizes from 0·12 to 0·20 min./cu. ft. and can be calculated from the equation $y = 0{\cdot}6x + 11$ where x is the number of logs in the load. (4) Loading time per log in loads of 40–70 logs ranges from 0·9 to 0·8 min. (5) Loading time increases linearly with the weight of the load and the time to make up a load of a given weight increases with decreasing log size. (6) Mean loading height affects loading time but fluctuations in loading height generally have little significance in practice. (7) Each increase of 1 m. in the distance of the lorry from the storage site above the mean distance of 1 m. increases loading time by ca. 2 min. The size of the log stacks and their distance apart also affects loading time. (7) Maintenance, rests, and loss of time account for 4% of total loading time. The equation $y = 0{\cdot}6\,x + 2e + 12$ gives total loading time [actual loading time plus interruptions] where x represents the number of logs in the load and e the distance in metres, of the near end of the stack from the lorry, for log loads of 1½ stacks and storage distances of < 50 m. [Results are given in graphs and tables with English legends and the equipment used is illustrated.] *From author's summary.*

2870. KANTOLA, M. Havusahatukkien autoon-kuormaus eri kuormaustapoja käyttäen. **[Loading coniferous logs on to a lorry by various methods.]** *Julkaisu, Työtehoseura, Helsinki* No. 75, 1955. pp. 91. 10 refs. [Fi.fi.e.]

The methods (illustrated) investigated include rope-loading, loading from a ramp, mechanical loading along skids, boom loading and loading by log hoist. Results are given in tables and graphs with English legends. [Cf. *For. Abstr.* 15 (No. 3642).]

372/377. Land Transport

See also Nos. 2835, 2837–43.

2871. SOETOPO, M. Kemungkinan[2] dalam eksploitasi setjara mekanis berdasarkan pengalaman[2] dan kesukaran[2] jang dihadapi dalam melaksanakan pekerdjaan tersebut dalam lingkungan Djawatan Kehutanan. **[Possibilities of mechanization based on experience gained and difficulties surmounted by the Forest Service in carrying out exploitation.]** *Rimba Indonesia* 4 (9/12), 1955 (410–47). 32 refs. [Jav.e.]

Summarizes experience during the last 6 years. Mechanical logging can be used profitably in Indonesia where there is a shortage of labour and animals but a large amount of timber, or where rapid exploitation is essential to prevent borer damage or bluestain. Costs, up to loading on to truck or railway wagon, excluding overheads, will be Rupiah 27/cu.m. Recommendations are made on equipment needed. Difficulties arising from shortage of engineers and of spare parts are discussed. *From author's summary.*

2872. HARRISON-SMITH, J. L. **Chutes for pulpwood extraction.** *N.Z. J. For.* 7 (2), 1955 (84–6).

Describes the use of simple wooden chutes to extract 3-ft. pulpwood bolts in operations designed to salvage dead standing Radiata Pine in hilly country. An angle of about 14° is required for the bolts to be 'self-starting' in the chutes, but this varies slightly with the weather. Once started they will keep going at a flatter angle, probably down to 12° or even 10°, but the chutes can be, and are, used even on flat ground, for it is much easier to push half a dozen bolts in the chutes than to carry them.

2873. **[The practical tables for the main cable of a skidder or an aerial ropeway.]** *Bull. For. Exp. Sta. Meguro, Tokyo.* No. 80, 1955 (119–87 + 11 gphs.) 2 refs. [Jap.]

Gives the basic formulae and comprehensive tables for the operating loads of various types of Japanese steel cables 6–30 mm. diam., in unsupported spans of 100, 200 . . . 1500 m., each at angles of 0, 5, 10 . . . 25° slope and catenary coefficients 0·03, 0·04 or 0·05 of the span, with 3 safety factors.

2874. KAUFMANN, G. VON. Zubringen von Holz im Hochgebirge mit Drahtseilen. **[Extraction of timber by cable methods in the high mountains.]** Bayerischer Landwirtschaftsverlag, Munich. 1954. pp. 77. 5 refs. [G.] Price *DM*.2·80.

A practical guide to cable methods for extracting relatively small amounts of timber, over distances usually > 250 m., in the mountains. The chapters cover: a review of the various methods; equipment, including accessories, methods of splicing etc.; setting up and operation of systems for extraction up-slope and gravity systems, in both cases either by dragging or by overhead lines; accident prevention; and handling and care of equipment.

2875. **Cableway drive unit; Universal long-distance skyline crane ('Hinteregger' type).** *For. Equipm. Note FAO* No. *C*.9.55, 1955. pp. 2.

The cable system (manufactured by R. Hinteregger and A. de Pretis, Villach, Austria) can be used on flat ground as well as slopes, logs can be skidded from a distance of 300 ft. and transported in a horizontal position, and the driving unit can be installed at any part of the circuit—not only at the upper terminal as is usual.

2876. SAMSET, I. Om lunning med to-tromlet skogbruksvinsj. **[Skidding with a 2-drum forestry winch.]** *Skogeieren, Oslo* 42 (2), 1955 (36–48). [Nor.]

Describes briefly, with illustrations, a winch developed as a result of investigations by Det norske Skogsforsøksvesen for use in conjunction with a tri-cable cableway system, and designed for easy transport by lorry, rail, tractor or horse. Describes with photographs and diagrams the setting up and use of the cableway, with particular reference to Norwegian conditions.

2877. **Pulley blocks for use with small diameter wire rope in the extraction of thinnings.** *For. Equipm. Note FAO* No. *C*.10.55, 1955 (2–3).

2878. FRITSCH, A. Többgépes szállítás szervezése vontatóknál. **[The organization of transport using several tractors.]** *Erdö* 4 (2), 1955 (65–9). [Hu.]

Time and labour in loading are shown to be saved by using several tractors (n) with the appropriate number of trailers ($n + 2$) for transport operations. The performance of each 3-ton tractor per turn, $(3\ n/(n + 2) \times 100)\%$, increases with the number of tractors used.

2879. K. Hilfsmittel zum Rücken von Stamm- und Schichtholz. **[Aids to the extraction of logs and cordwood.]** *Forst- u. Holzw.* 11 (1), 1956 (20–2). [G.]

Gives brief particulars of, and prices for, German logging equipment such as chassis, arches, trailers and vehicles for horse, tractor and hand transport.

2880. JACOBSEN, B. Nogle undersøgelser over udslæbning af løvetrækævler. **[A study on skidding hardwood logs.]** *Dansk Skovforen. Tidsskr.* 39 (10), 1954 (531–62). [Dan.]

Results of time studies on skidding in 3 districts, using tractors or horses, chains or tongs, with or without a logging arch, and with crews of different sizes, are given in graphs and tables. These include data on: division of time between different operations; time taken by different methods over different skidding distances but constant log size; the effect of ditches on skidding time; and comparative costs for tractor and horse skidding. Recommendations are made for changes in technique and methods for horse and tractor skidding.

2881. ABELL, T. Forenklet udslæbning med traktor og kævlevogn: Hvidkilde skovdistrikt. **[Simpler skidding using a tractor and logging arch in Hvidkilde forest district.]** *Dansk Skovforen. Tidsskr.* 39 (3), 1954 (138–42). [Dan.]

Describes, with photographs of the details, a device comprising a cable-drum at the back of the tractor, with the cable running over a block at the top of the logging arch and attached to tongs (used to winch the log to the arch and to support it during skidding). The cable is kept taut during skidding by a ratchet-and-pawl device at the drum.

2882. GLÄSER, H. Bündelweiser Schichtholz-Transport in Kanada. **[Transport of bundled cordwood in Canada.]** *Holz-Zbl.* 82 (35), 1956 (457). [G.]

Describes and illustrates a tracked trailer with a tilting platform. When the trailer wheels, with the aid of a winch in the tractor, are pulled towards the tractor, they move to one end of the platform, so that the platform tilts to the ground by its own weight, and the bundled cordwood can easily be winched on. Once the load has passed the point of

balance, the platform automatically rights itself, the wheels are pulled back towards the middle of the platform, and the tractor is ready to move.

2883. **The long County Tractor.** *For. Equipm. Note FAO* No. *C.*10.55, 1955 (1–2).

Describes, with photographs, the work involved n lengthening the standard County Tractor by 36 in. in track length on the ground and fitting 30-in.-wide tracks, in order to obtain lower ground pressure and improved drain-crossing capacity when used on peat bogs etc.

2884. **The Rhino tractor.** *For. Equipm. Note FAO* No. *C.*11.55, 1955. pp. 1.

Describes and illustrates an amphibious tractor that can climb 65% slopes, travel on roads at 45 m.p.h., and, with Hydrojet propulsion, be operated in deep water. Manufactured by Marmon-Herrington Co. Inc., Indianapolis.

2885. **Rear wheel girdles for wheeled tractors.** *For. Equipm. Note FAO* No. *C.* 10.55, 1955 (3).

Reports on tests made by the U.K. Forestry Commission of wheel girdles produced by Roadless Traction Ltd., of Hounslow, to improve wheel grip in operations calling for a heavy drawbar pull. They gave a very marked improvement and can increase the payload on a hauled tractor by as much as 50%.

2886. SAUZE, F. Entretien des moteurs diesel et des tracteurs à chenilles diesel. [**Service and maintenance of diesel wheel- and crawler-tractors.**] *Bois For. Trop.* No. 45, 1956 (31–51). [F.]

2887. NAIR, K. K. **The Cochin State forest railway.** *Indian For.* 82 (2), 1956 (91–2 + 4 photos).

Describes the line and its working. It is a metre-gauge railway, 50 miles long, in steep hilly country. On the steeper slopes, where locomotive traction is not possible, use is made of gravity to let loaded trucks down and at the same time bring up empty trucks on parallel rails. It is used for bringing timber from the hills to the plains.

378. Water Transport

See also No. 3392.

2888. [**Vancouver log salvage district.**] *B.C. Lumberm.* 40 (1), 1956 (34).

Gives a map, and details the boundaries of this district (between Vancouver Island and the mainland), with a brief summary of the salient regulations for the salvaging of logs in it.

2889. TUOVINEN, A. Miten talvella niputettu mäntypaperipuu ui? [**How does Pine pulpwood bundled in winter float?**] *Metsät. Aikak.* 1955 (12), (411, 414). [Fi.e.] (*Metsätietoa, Helsinki* No. 2, 1955.)

Pine pulpwood, bundled in winter after seasoning through the summer in crosswise stacks, floats very well (loss about 1%). After unfavourable drying conditions (e.g. when the stacks are so close to the water that the base of the stack gets flooded in autumn) loss rises to 10–30%. Pulpwood prepared in the summer or autumn before floating has had insufficient time for drying, and floating loss may be as high as 30%. [Cf. *For. Abstr.* 17 (No. 1674).] *From author's summary.*

2890. SONLEY, G. R. **Flotation of Aspen.** *Pulp Paper Mag. Can.* 57 (2), 1956 (95–6). 1 ref. (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1543 (*B–9–b*).)

The following facts have been experimentally proved: (*a*) winter-cut *Populus tremuloides* landed on ice shows excessive sinkage; (*b*) winter-cut and launched in August, it suffers practically no loss; (*c*) green, it suffers excessive sinkage; (*d*) chemically killed, it floats well with moisture content equal to or greater than green Aspen; (*e*) wholly or partly barked (stripped from 2 sides), cut in summer, and driven the following spring, it floats well; (*e*) rough-piled wood dries very little (e.g. Birch in Finland). The author advances the hypothesis that it is the live wood (*a*) and (*c*) that will absorb more water and suffer excessive sinkage. All cutting should start after leaf-flush in the spring and stop in time to allow at least 2 months' summer and autumn drying. This period should be more exactly determined. A saving of > $2/cord would accrue if Aspen could be driven unbarked. [Cf. *For. Abstr* 15 (No. 75).]

2891. BRAĬNES, B. JA. Za peredovuju tehnologiju na reĭdah v uslovijah podpora (Iz opyta rekonstrukcii Kriveckogo reĭda.) [**Technological improvements in timber-floating-and-rafting depots in the absence of natural current (From the reconstruction of the Krivcy depot).**] *Lesn. Prom.* 14 (4), 1954 (22–25 + 1 photo). [Russ.] L.S.

In view of the large water reservoirs (artificial lakes) recently constructed on the rivers Volga and Kama, timber floating must be done in the virtual absence of any current. The logs are shepherded in from a distance of ca. 200 m. to about 40–50 m. from the terminal boom by means of two CL-2 winches mounted on the terminal boom, on either side of the boom gate. Each winch drives an endless cable passing over a pulley ca. 200 m. upstream on one of the side booms. A collecting cable is looped round the mass of logs, with its ends attached symmetrically to both endless cables so that the logs are pulled towards the gate. The collecting cable is returned by reversing the winches. In the last 40–50 m. before the gate, the logs are propelled by means of friction drums (2 on either side of the channel) spring-loaded on brackets (two 10-m. × 20 × 20-cm. beams). Other drums [designed by Labutin, but not described] are used in the sorting section of the depot.

2892. MARKOV, S. G. Zapani i napravljajuščie bony pri splave lesa v pučkah. [**Terminal and diversion booms for timber floated in bundles.**] *Lesn. Prom.* 14 (7), 1954 (28–9). [Russ.] L.S.

Presents some data, obtained both from practical experience and laboratory experiments, on the operation of transverse and longitudinal terminal booms and diversion booms during bundle floating. Discusses the maximum current velocity permissible for receiving and storing bundles in terminal booms. The pressure of bundles on terminal booms, the stability of the floating portions of transverse and

longitudinal booms, and the construction of diversion booms are also discussed.

2893. MUČNIK, S. JA. Novoe v rašcete i konstrukcijah setčatyh zapaneĭ. **[New calculations and designs for cribwork terminal booms.]** *Lesn. Prom.* 14 (9), 1954 (24–5). [Russ.] L.S.

38. Forest Engineering

381. Materials (including Explosives and Their Use)

See Nos. 2849, 2898.

383. Roads and Bridges

See also Nos. 2839, 3159.

2894. MESNIL, H. De l'évolution des techniques routières en forêt de Compiègne. **[The development of road-making techniques in the forest of Compiègne.]** *Rev. for. franç.* 8 (1), 1956 (1–21 + 6 photos). 11 refs. [F.]

2895. THIELMANN. Kaltasphalt im Waldwegebau. **[Cold bituminous binders in forest road-building.]** *Forst- u. Holzw.* 10 (13), 1955 (268–71). [G.]

The author discusses modern techniques for the building and surfacing of forest roads, made necessary by the recent increase of mechanized logging traffic, and the specific problems of forest roads. He describes in detail several methods using cold binders; among their advantages over 'hot' methods, is their independence of the weather, which alone is likely to save in wages the extra material cost involved.

2896. MOLTESEN, P. Forsøg med bituminøse belægninger på skovveje. **[Study on bituminous surfaces for forest roads.]** *Dansk Skovforen. Tidsskr.* 39 (3), 1954 (121–37). [Dan.]

Methods of laying down bituminous surfaces are briefly described. A number of forest roads were surfaced in 1951–53 using different methods of preparing the site, with different rates of tar or asphalt as binder, different grades of chips or gravel etc. Some indications of costs are given. Road surfaces after 1–3 years are generally satisfactory but no conclusions as to the relative advantages of the different methods can be drawn. For forest roads, low maintenance costs are the most important factor, and curves are given showing the relation between annual expenditure and years of service for different initial costs.

2897. SCHLEICHER. Praktische Geräte zur Dolenreinigung an Waldwegen. **[Useful tools for cleaning culverts on forest roads.]** *Forst- u. Holzw.* 10 (13), 1955 (273–4). [G.]

Describes and illustrates two tools, one of them hinged.

385. Drainage, Irrigation, Sedimentation. Water Supply

2898. MACKENZIE, R. F. **The use of dynamite in forest ditching.** *Sylva, Edinb.* No. 35, 1955 (17–8).

A practical description of methods, soil types, and water conditions suitable for the use of dynamite.

2899. **Trench digger.** *For. Equipm. Note FAO* No. *B.*6.55, 1955. pp. 2.

The Cleveland Model 320 Trencher, manufactured by Meermans Inc., Ohio, can make drainage ditches 12 ft. wide at the top, 7½ ft. deep, and 52 in. wide at the bottom at a speed of 8 ft./min. It can discharge spoil simultaneously to both sides of the ditch.

2900. KOIVISTO, A. A. Aikatutkimuslukuja metsäojan aurauksesta. **[Time studies on ditch-digging by plough for forestry.]** *Metsät. Aikak.* 1956 (1), (31–4). [Fi.e.]

While the study was too limited for any definite conclusions to be drawn, results suggest that the use of tractor and plough for ditch-digging reduces costs of construction as compared with manual work, but increases cost of clearing and maintenance. *From author's summary.*

4. FOREST INJURIES AND PROTECTION

See also Nos. 2366, 3504.

2901. GRIMAL, R. Les dangers de maladies et d'invasions d'insectes par l'introduction d'arbres exotiques. **[The danger of disease and insect epidemics from the introduction of exotic trees.]** *Chêne-Liège* Nos. 1525–7, 1956 (25 . . . 29; 31 . . . 35; 17–8). [F.]

Reviews experience with exotic species (especially N. American conifers) introduced into Europe, and stresses the importance of long-term experimental plantations before embarking on large-scale planting of an untried exotic species.

41. General Technique of Forest Protection. Types of Injury

414. Chemical Control

2902. SCHINDLER, U. Forstliche Praxis und Forstschutzmittelprüfung. **[Practical forestry and the testing of [chemical] preparations for forest protection.]** *Forst- u. Holzw.* 10 (5), 1955 (94–6). [G.]

Describes the foundation, composition, and working procedure of the German Testing Committee for the attestation of preparations used in forest protection (herbicides, insecticides, fungicides, repellents etc.), which publishes an annual list of approved proprietary chemicals and appliances.

2903. SCHINDLER, U. Tragbare Spritzgeräte für den Forstschutz. **[Portable spraying equipment for**

forest protection.] *Forstsch.-Merkbl. niedersächs. forstl. VersAnst.* (*Abt. B*) No. 6, 1955. pp. 27. 7 refs. [G.]

Describes, with illustrations, different types of equipment and accessories (nozzles etc.) available from German firms, and discusses the advantages of the different types, maintenance, use, organization of spraying and costs.

2904. BURCKHARDT. Die Mannesmann-Regenkanone, ein neues Gerät zur forstlichen Schädlingsbekämpfung. [**The Mannesmann 'rain gun', a new implement for forest pest control.**] *Forst- u. Holzw.* 10 (22), 1955 (462–4). [G.]

In this sprayer of German manufacture the fluid is pumped into the main container from a large tank mounted on a separate trailer. As soon as pressure in the main container exceeds that in an auxiliary one governing the valve, the fluid is expelled at 4–6 atm. pressure in a jet with a horizontal throw of 70 m. (50 m. in a smaller model) or a vertical throw of 35 m., dispersing into a fine spray of mist 4–5 m. wide. The frequency of 'shots' and the angle and direction of the 'gun' are controllable. Minimum power requirements for working the pump and pulling the tank-trailer, are 15 h.p. If two tanks on separate trailers are used, the machine can work without interruption. In this manner 25–30 ha. of Pine plantations and Oak stands could be sprayed under optimum weather and topographical conditions in a 12-hour day with a crew of 2 on the vehicle carrying the pump and 1 on the extra trailer. Pines were sprayed against *Lophodermium pinastri* with 0·3% Cupravit [$CuSO_4$?] or 0·2% Dithane, using 500–1000 litres/ha. according to age, the Oaks with 0·2% Cosan against Oak mildew [*Microsphaera quercina*?], using 600–1400 litres/ha. at a total cost of 20–35 DM/ha.

415. Other Means of Control

2905. **Plant protection agreement for the South East Asia and Pacific Region.** *Rep. 22nd Sess. Council FAO* 1955 (32–46). [E.F.Span.)

Includes a list of pests and diseases not yet established in the South-East Asia and Pacific Region.

42. Injuries from Inorganic Agencies other than Fire

2906. KOŚCIELNY, S. Usychanie dębów. [**Die-back of Oaks.**] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (39–52). [Pol.russ.g.]

Discusses the main causes of die-back of older Oak trees: (1) variation of the water-table; (2) unsuitable site (especially unfavourable soil); (3) faulty silviculture (felling, thinning) enhancing the harmful effect of winds, and (4) old age.

421. Air Currents

See also Nos. 2554, 2642–3.

2907. STOECKELER, J. H., and ARBOGAST, C., JR. **Forest management lessons from a 1949 windstorm in northern Wisconsin and Upper Michigan.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 34, 1955. pp. 11.

Losses in a storm on 10 Oct. 1949 were especially heavy on exposed S. and S.W. slopes, swamp margins, ridges and the exposed N. and N.E. shores of lakes and streams. Except in small, heavily damaged areas, most of the trees blown down were overmature or defective. Recommendations are made on measures to reduce future damage by removing species and classes of trees (briefly indicated) particularly liable to blow down, within various vegetation types.

2908. LASSEN, E. Et Stormfald i gammel Bøgeskov. [**Storm damage in old Beech forest.**] *Dansk Skovforen. Tidsskr.* 40 (6), 1955 (259–70). [Dan.]

Describes the extent and distribution of storm damage in a 170-year-old Beech forest near Stenderup in May 1953 and the methods, problems, and costs of salvage.

422. Temperature Influences. Frost. Heat. Drought

See also No. 2974.

2909. BEGEMANN. Beobachtungen zu Spätfrostschäden bei der Fichte. [**Injuries by late frosts to Spruce.**] *Forst- u. Holzw.* 10 (12), 1955 (251–2). [G.]

Describes the formation of exceptionally long leading shoots on 11-year-old Spruce of early growth habits, whose lateral shoots were killed by late frosts in two consecutive years.

2910. OLBERG, A. Barfrostschäden an jungen Holzpflanzen. [**Frost injuries to young woody plants in the absence of snow cover.**] *Forst- u. Holzw.* 10 (7), 1955 (136–8). 11 refs. [G.]

A discussion, based chiefly on German literature, of the physiology of such injuries, the weather and soil conditions under which they occur, and preventive measures. Apart from Oak and Douglas Fir, dealt with in general terms, frost losses of *Prunus serotina* and *Castanea sativa* plants in a nursery during 1953–54 are reported.

2911. KRAHL-URBAN, J. Winterfrostschäden an Trauben-, Stiel- und Roteichen. [**Frost damage in winter to *Quercus sessiliflora, Q. robur,* and *Q. borealis.***] *Forst- u. Holzw.* 10 (6), 1955 (111–3). 9 refs. [G.g.]

Cites accounts in the German literature of frost damage to acorns and young plants, and describes experiences at Bramwald, where, in January 1954, there occurred a long spell of temperatures between − 14° and − 18° C., no snow, and dry easterly winds. Four-year-old Oak of German provenance suffered little, but various 1-year-old, including many from the Spessart, and 2 plots of *Q. borealis*, were almost total losses. Seeds from individual trees, partly from Bramwald, partly 'plus-trees' from other parts of Germany sown in spring 1953, showed marked differences in resistance, Sessile Oak, on the whole, being hardiest. Three-year-old Oaks from France, England and Sweden, and 1-year-old plants from France, Jugoslavia and Switzerland were nearly wiped out. One Swedish (Strömsholm), one English (Alice Holt), and 3 Danish provenances (Vemmetofte), all Sessile Oaks, fared slightly better, with survival %s of 16, 20, 31, 40 and 47 respectively.

2912. STEINGASS. Zu: Tod durch Winterfröste an ein- und zweijährigen Eichen. **[On 'Death through winter frosts of one- and two-year-old Oaks'.]** *Forst- u. Holzw.* 10 (1), 1955 (10–1). [G.]

Comments on Junack's article [cf. *For. Abstr.* 16 (No. 587)] and adds the author's experiences from the Solling region. Deaths are chiefly attributed to the drying effects of strong east winds combined with frozen soil bare of snow. Where the plants had protection against wind, many survived. Even a stump on the lee side, by lifting the air stream, was often sufficient.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

2913. STONE, E. L., and BAIRD, G. **Boron level and boron toxicity in Red and White Pine.** *J. For.* 54 (1), 1956 (11–2). 6 refs.

The field symptoms of boron poisoning in several species of Pine are described. Such were induced in *P. resinosa* and *P. strobus* in acid sandy soils with applications as low as 10 lb./acre. At 50 lb./acre symptoms were conspicuous but the total foliage area affected was still rather small. [Cf. *For. Abstr.* 4 (p. 224).]

425. Chemical Influences (Atmospheric)

2914. AZEVEDO, N. F. DOS SANTOS DE. **Injuries to vegetation.** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 53-*F*2, 1955. pp. [2]. [E.] Limited distribution.

Notes on two cases of injury to trees due to atmospheric pollution: (1) to *Pinus pinaster* and *Eucalyptus globulus* surrounding a mine working a smelter for pyrites, and (2) to *P. pinaster* subjected to exhaust gases from an oil engine.

2915. ZIEGER, E. Die heutige Bedeutung der Industrie-Rauchschäden für den Wald. **[The present significance of industrial fume damage for the forest.]** *Arch. Forstw.* 4 (1), 1955 (66–79). 9 refs. [G.] (Also in *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden, Dresden* 4 (3), 1954/1955.)

Includes a historical review; notes on fume damage by corrosion and by interference with assimilation in trees (mainly Spruce by SO_2) and on damage to soil; diagnosis by analyses of plant parts, soil and air; biological tests such as the reaction of damaged leaves to sunlight and the stimulation in them of wax secretion [cf. *For. Abstr.* 16 (No. 3779]; valuation of damage; general considerations; and protective measures, both silvicultural and technical. Inconclusive tests on resistant Spruce growing in damaged stands indicate (if they receive general confirmation) that Härtel's cloudiness test for increased wax secretion, referred to above, may be of decisive importance for indicating both damage and resistance. The author proposes in detail the setting up of an industrial-fume-damage commission for the German Democratic Republic on which the Ministries of Labour and of Lands and Forests should be represented, the latter providing the Secretariat. Its headquarters should be near a damaged region with experts posted in the area. Damage to the forest and its prevention should be its only concern. Its studies should include the pinpointing of sources and the estimation of volumes of fumes emitted; the fixing of limits for districts and the working out of regulations for maxima permitted to factories; the declaration and definition of damaged areas; and expert advice on fume-abating filters. However effective a preventive campaign may be, claims for damage will be made and possibly fought. It will be useful to the court in such cases to have at hand an authority to which reference can be made for precedents over a long period.

2916. JAHNEL, H. Physiologisches über Einwirkung von Schwefeldioxid auf die Pflanzen. **[Physiological effects of SO_2 on plants.]** *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden, Dresden* 4 (3), 1954/1955 (3–7). [G.]

A general summary of the changes caused by, and the visible symptoms of, both chronic and acute poisoning in hardwoods and conifers, stressing the difficulties of diagnosis and conclusive tests. [Cf. *For. Abstr.* 16 (No. 3779).]

2917. WIENHAUS, H. Chemie der Rauchschäden. **[Chemistry of smoke damage.]** *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden, Dresden* 4 (3), 1954/1955 (19–20). [G.]

Lists various toxic substances, in addition to the chief gaseous poison (SO_2), their effects on trees, and the manufacturing processes emitting them into the atmosphere. The injurious effects of some factories on the forests in which they were hidden were such as to betray the factories to enemy bombers.

2918. PRELL, H. Rauchschäden bei den Tieren des Waldes. **[Smoke injuries to forest animals.]** *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden, Dresden* 4 (3), 1954/1955 (10–8). 10 refs. [G.]

On the basis of experiments made near the Freiberg smelting works, describes the serious effects of arsenic poisoning on bees and game through cumulative deposits on forage plants.

43. Forest Fires

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

See Nos. 2854–5.

432. Prevention and Control

See also Nos. 2865, 2931.

2919. PERRY, V. **Fire prevention: Let's hit the ball!** *B.C. Lumberm.* 40 (1), 1956 (24 . . 27, 31).

Discusses, with a suggested curriculum, the 5-day firewardens' course sponsored by the British Columbia associations of lumbermen, of loggers and of professional fire wardens, the department of University extension, the faculty of forestry, University of B.C., and the forest service.

2920. HASTINGS, J. **Television tested for forest fire detection in California.** *Fire Control Notes* 17 (1), 1956 (24–6).

Preliminary tests indicate that an 8-in. lens is limited to ca. 10 miles for picking up small smokes

and detail. The 16- and 20-in. focal-length lenses brought detail at distances not reached by the 8-in. lens, but were not good for scanning. Best results would appear to be obtained by the use of a camera with a multiple lens installation. [Cf. *For. Abstr.* 16 (No. 3105).]

2921. **Improved cargo static line safety release.** *E.D. Rep. U.S. For. Serv.* No. 39, 1955. pp. 5.

2922. BROWN, A. A. **Prospects of extinguishing fires from the air.** *Fire Control Notes* 17 (1), 1956 (5–8).

Briefly reviews experiments made up to date, including a recent extensive study (Operation Firestop) made in California.

2923. LESLIE, A. P., and NICHOLS, J. D. **Paper bags for aerial water bombing of forest fires.** *Fire Control Notes* 17 (1), 1956 (1–4). [Ontario Department of Lands and Forests.]

2924. ELY, J. B., and JENSEN, A. W. **Air delivery of water helps control brush and grass fires.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 99, 1955. pp. 12. 6 refs.

Describes the successful use of a biplane (normally used for crop dusting) fitted with a special tank outlet [illustrated] and capable of carrying 120 gal. of water, in controlling small fires and some parts of large ones.

2925. POST, D. M. **Fire suppression unit for the small forest.** *Fire Control Notes* 17 (1), 1956 (18–9). [School of Forestry, University of Florida.]

Briefly describes a machine designed for owners of small forests, costing < $700, tractor-drawn, with a 325-gal. tank, high-pressure pump and a 6-h.p. engine. The pump can deliver 5–65 gal./minute at 20–140 lb. pressure.

433. Salvage and Disposal of Fire-damaged Timber

2926. SMITH, W. J. **The strength of fire-killed timbers.** *Repr.* from *Prairie Lumberman* April, 1955. pp. 3. [Forest Products Laboratories of Canada.]

Bending and compression tests on Lodgepole Pine (*Pinus contorta*) timber (green, barked and unbarked; fire-killed in 1912, 1936, 1943, and 1949, and felled in 1953) indicate that seasoning of the green barked timber increases both its strength and stiffness. Further increases (and no trace of decay) were found in timber that had been killed by fire in 1949. Timber so killed in 1943 was severely decayed and had lower strength than that killed in 1936. Preliminary results show that the 45-year-old material had strength values exceeding even those of green timber, presumably because decay was negligible. It is concluded that in fire-killed timber, strength is related to decay, which can be estimated visually, and not necessarily to age.

435. Benefits of Fire Control. Injurious Effects of Fire. Fire Losses

See also Nos. 2642, 3084.

2927. BARTLETT, H. H. **Fire in relation to primitive agriculture and grazing in the tropics: annotated bibliography.** University of Michigan Botanical Gardens, Ann Arbor. 1955. pp. 570.

References deal largely with the destruction of vegetation (particularly forest vegetation) for the sake of shifting and other primitive types of agriculture and grazing. It is arranged alphabetically under authors, and has a subject index.

2928. TOOLE, E. R., and MCKNIGHT, J. S. **Fire and the hapless hardwood.** *Sth. Lumberm.* 191 (2393), 1955 (181–2). [Southern Forest Experiment Station.]

Observations after a fire in an experimental stand in the Mississippi delta showed that both seedlings and larger trees suffered severely. On bottomland Red Oaks, only wounds < 2 in. wide healed without infection. In others, rot spread upwards and inwards, taking about 4 years to reach the heartwood. Trees should be salvaged if the charred area extends vertically > 6 feet from the stump or horizontally > 2½ feet beyond half the circumference.

2929. TEVIS, L., JR. **Do forest fires destroy seed-eating rodents.** *Timberman* 57 (4), 1956 (76–7).

A study of a burned area near Yreka, Calif., indicated that the fire had not reduced the number of mice or kangaroo rats; afterwards the mice lived on insects and the rats on stores of seed. Ponderosa Pine seed sown in a number of places was not touched in the first 2 days, indicating that rodent damage in the immediate future would be slight. It is supposed that rodent populations, though not significantly reduced by the fire, were too small to cover the whole burned area. Numbers of mice would, however, rise sharply within a year.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 2658, 2661–2, 2820.

2930. VLAMIS, J., BISWELL, H. H., and SCHULTZ, A. M. **Effects of prescribed burning on soil fertility in second growth Ponderosa Pine.** *J. For.* 53 (12), 1955 (905–9). 28 refs.

Sandy loam and loam (derived respectively from granite and andesite) which had been subjected to (*a*) heavy (piled slash), (*b*) light (litter) burns, and (*c*) no burn, were assayed for fertility by greenhouse pot tests under N, P, K applications, using as criteria the dry weights of lettuce and barley produced. In the (*c*) soil, N and P were low and K adequate. N increased with intensity of burning, with greater effects at the surface and fading out with time. One soil showed greatly increased P with burning, the other none. This latter (the andesite-derived soil), is presumed to fix P in large amounts.

2931. SCHAEFFER, G. K. **The effect of prescribed burning on the occurrence of wild fires.** *Sth. Lumberm.* 191 (2393), 1955 (177–8).

Observations at Osceola National Forest, Florida, of which ca. ¼ is control-burned annually, showed that in the dry summer of 1954 more than half the lightning fires started in 5-year-old 'roughs'. Incidence of logging fires was 1 per mile in 5-year-old

and 1 per 2 miles in 4-year-old rough but none in the first 2 years after burning.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also No. 2820.

2932. NAUDE, T. J. **Biological control of Prickly Pear.** *Fmg. S. Afr.* 30 (357), 1955 (493–4, 523). E.M.B.

A review of work in South Africa in the biological control of *Opuntia megacantha.*

2933. FAIL, H. **The effect of rotary cultivation on the rhizomatous weeds.** *Journal of Agricultural Engineering Research, Silsoe* 1 (1), 1956 (68–80). O.R.E.

A tractor-mounted L-bladed cultivator was used to cut up the rhizomes of the weeds into short lengths. Bracken-eradication experiments were carried out at two centres in Northumberland. By starting in June, when the fronds had expanded, and repeating the treatment at intervals until a depth of 10 in. was reached (done, with some difficulty, in 4 treatments) the bracken was eradicated, no growth appearing after 3 years. When cultivation was begun earlier and was completed in a few weeks, weak fronds appeared. Experiments with a subsoiler, to break up the rhizomes without destroying the turf or chopping off the fronds, resulting in marked desiccation of the bracken immediately after treatment, are being continued. *From author's summary.*

2934. SHIMODA, M. **[Research in the clearing of fern site. (Report 1.) On the extermination of fern by means of flame projector.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 79, 1955 (119–24). [Jap.jap.e.]

Attempts to kill *Gleichenia* spp. by poisoning with Ammate or $NaClO_3$ were unsuccessful. An 87% kill was obtained by cutting and burning with a flame torch in the first week of July and August when the soil surface is dry. Costs/0·1 ha. amounted to 925 yen for wages and 660 yen for kerosene (20 litres).

2935. HILL, D. D. **Gorse control.** *Sta. Bull. Ore. agric. Exp. Sta.* No. 553, 1955. pp. 16.

Ulex europaeus, introduced as an ornamental shrub, had become a pest in the Pacific Northwest and a considerable fire hazard. Notes are given on control by burning, cultivation, goat browsing, and afforestation, and tabulated data on control by a number of chemicals.

Weeds: Chemical Control

See also Nos. 2721–2, 2727, 2736, 2800–1, 2902, 2934–5.

2936. BURNS, E. **Eradication of Gorse and Briars.** *Irish For.* 12 (2), 1955 (64–6).

Trials were made of spraying with Phordex (a mixture of 2,4-D and 2,4,5-T) and SBK (active ingredient 2,4,5-T) in aqueous solutions applied from a knapsack sprayer, to control gorse and briars. Spraying was carried out in fine weather in August, at rates of 1 gal. and ½ gal. to 100 gal. water, and was successful in all cases.

2937. WURGLER, W. Destruction des broussailles dans les pâturages de montagne. **[Elimination of brush from mountain pastures.]** *Annu. agric. Suisse (n.s.)* 4 (7), 1955 (771–81). [F.f.g.e.] (*Publication, Stations Fédérales d'Essais Agricoles, Lausanne* No. 478.) E.M.B.

Reports the effects of sprays of esters of 2,4-D and 2,4,5-T on *Juniperus communis, Salix aurita, S. nigricans, Populus tremula, Alnus incana, Corylus avellana, Sorbus aucuparia, Crataegus oxyacantha, C. monogyna, Rubus* spp., *Rosa dumetorum, Ononis spinosa, O. repens, Genista tinctoria, Vaccinium myrtillus, Picea abies* and other useful and non-useful species.

2938. SCHUBERT, G. H. **Recent trials with 2,4-D and 2,4,5-T to kill brush in the Sierra Nevada in California.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 102, 1955. pp. 7.

The effect varied with species of brush (*Ceanothus cordulatus, C. parvifolius, Castanopsis sempervirens, Chamaebatia foliolosa* and *Arctostaphylos patula*), age of plant and time of application. Complete kill was hard to achieve but total crown area was generally reduced sufficiently to allow trees to compete satisfactorily with the surviving brush.

2939. MCKAY, A. D. **A bush control trial at the Matopos Research Station.** *Rhod. agric. J.* 52 (6), 1955 (505–12 + 5 photos). 2 refs.

In order to find an effective method of thinning out brush in grazing areas, trials were made with chemical control of *Terminalia sericea* and *Acacia rehmanniana.* 2,4,5-T was more effective than 2,4-D, but the % kill was low. A mixture of both proved no better than 2,4,5-T alone. As_2O_3 gave the best results though kills were < 100%. The best method of application was by frill girdling of the freshly cut stumps. Stab treatments were better than basal bark treatments. *From author's summary.*

2940. BISSET, W. J., and SHAW, N. H. **A comparison of D.C.P.A., T.C.P.A., and arsenic for killing Eucalypt regrowth in sub-tropical native pastures.** *Journal of the Australian Institute of Agricultural Science, Melbourne* 20 (3), 1954 (177–81). 3 refs. C.G.B.

In these experiments in Queensland, Na salts of 2,4-D and 2,4,5-T, as water solutions or emulsions, were applied to frill-girdled saplings of ca. 4 in. diam. and to stumps of small bushes, mostly of *Eucalyptus tereticornis,* at about 1 fluid oz./tree. While results with stronger concentrations (> 10%) of As_2O_3 and As_2O_5 were consistently good, results with the phenoxyacetates varied from 100% to poor, the stronger solutions in general being better, but no consistent difference was found between types of compound or times of application. In trials with *E. tessellaris* only 2,4,5-T and As were effective, but while a transference of As from treated to untreated trees sometimes occurred via root fusions, no transference was observed with 2,4,5-T. This might be of importance in the chemical thinning of Eucalypt regeneration.

2941. **Use of 2,4,5-T.** *Rep. Dir. For. Qd. 1954/55*, 1955 (11–12).

Experiments in thinning natural regeneration of Blackbutt [*Eucalyptus pilularis*] with 2,4,5-T were carried out on a large scale [cf. *For. Abstr.* 16 (No. 3119)]. A 0·5% water solution of 2,4,5-T amine salt was applied to stumps after felling, and stump height kept to a maximum of 12 in. This resulted in an increase in costs of 45% over ordinary thinning. Assessment of a treated block indicated a kill of 75% for Blackbutt and 80% for Smudgee (*Angophora woodsiana*), which are the most important species in the area. On the control block (normal treatment only) all stumps coppiced vigorously. Excellent results were obtained in a further trial with tree injections of 5% 2,4,5-T butyl ester in distillate; one injection of solution to each 5 in. of girth gave an over-all kill of 98%. The only species in which a 100% kill was not obtained were Smudgee (93%), *Eucalyptus intermedia* (80%) and *E. drepanophylla* (91%).

2942. LINDEN, G. Die Schnittflächen- und Stammgrundbehandlung mit 2,4,5-T zur Verhinderung und Bekämpfung des Stockausschlages. [**Treating the cut surface or base of stumps with 2,4,5-T to prevent and control coppicing.**] *Forst- u. Holzw.* 10 (4), 1955 (74–7). 8 refs. [G.g.]

Reports on trials with Tormona 100, a 2,4,5-T ester in diesel oil, carried out in the Odenwald and Taunus in 1952–54. Stump surfaces, stump bases and foliage of shoots were treated, using ca. 200 litres/ha., as a spray. January to June proved the best time for this treatment, which prevented coppicing or killed coppice shoots in Hornbeam, Black Poplars, Maple species, Ash and others, and, partially, in Oak. Pines and Larches planted the following spring suffered no damage.

2943. HARRINGTON, T. A. **Loblolly seedling survival after hardwood control by 2,4,5-T.** *J. For.* 54 (1), 1956 (39–40). [Southern Forest Experiment Station.]

A dense stand of hardwood saplings (6500/acre) in Texas were treated in Dec. 1953 by (*a*) heavy basal spraying with a solution of 1 gal. 2,4,5-T/16 gal. diesel oil, (*b*) cutting close to the ground and painting stumps with the same solution of 2,4,5-T, and (*c*) cutting without the use of a herbicide. *Pinus taeda* seedlings were planted within 24 hours of treatment on each plot, set 4 ft. apart, and a second planting was made in February when it was expected that any residual toxicity would have been dissipated. Survival % in June for Dec. and Feb. plantings was as follows:—(*a*) 97 and 95, (*b*) 89 and 93, and (*c*) 89 and 91. On (*a*) plots, most of the hardwoods reached half or full leaf before the toxic effects were pronounced, and the dying foliage partially shaded the Pines throughout the spring and summer. On (*c*) plots a vigorous stand of sprouts developed by midsummer and gave the seedlings some shade. On (*b*) plots seedlings had little or no shade. By Nov. 1954, after a period of drought, survival on (*a*) was 84% compared with 57 and 53 for (*b*) and (*c*)—a difference not fully explained by this study.

442. Parasitic Higher Plants. Climbers and Epiphytes

2944. FILHO, L. E. DE MELLO. *Pilostyles stawiarskii* Vatt, parasita da bracaatinga. [***P. stawiarskii*, a parasite of *Mimosa bracaatinga*.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (283–6). [Port.e.]

P. stawiarskii, a new species, was found parasitizing *M. bracaatinga* in a dense and almost homogeneous stand that had grown up after burning of the original vegetation 6 years earlier.

2945. KUIJT, J. **Dwarf mistletoes.** *Bot. Rev.* 21 (10), 1955 (569–627). 93 refs. [Forest Biology Division, Science Service, Canada Dept. of Agriculture.]

A review of selected literature on the genus *Arceuthobium* under the heads: morphology and anatomy (including flowering, seed dispersal and germination), physiology, host relationships (morphological effects on host, relation to fungus and insect attack, methods of control). There are parasite/host and host/parasite lists and a list of selected illustrations. A taxonomic review is deferred for the present.

2946. ACATAY, A. Ormanlarimizda zarar yapan ökseotlari. [**The mistletoe danger in [Turkish] forests.**] *Istanbul Üniv. Orm. Fak. Derg.* 4*B* (2), 1954 (26–9). 4 refs. [Turk.]

A short illustrated account, in which the author makes the point that much additional damage is done by graziers felling infested trees in order to get the mistletoe. The 3 species found in Turkey are: *Viscum album*, *Loranthus europaeus* (on Oaks) and *Arceuthobium oxycedri* (on Junipers).

2947. KLEPAC, D. Utjecaj imele na prirast jelovih šuma. [**Effect of *Viscum album* on the increment of Silver-Fir stands.**] *Šum. List* 79 (7/8), 1955 (231–44). 9 refs. [Croat.croat.f.]

Measurements on increment cores from (1) a group of 3011 healthy trees of *Abies alba* (344 borings being made), and (2) a group of 521 trees attacked by *Viscum album* f.sp. *abietis* (forming together a Silver Fir stand with admixture of Spruce and Beech on 18·40 ha., at 800 m. alt.; stocking of Silver Fir 402 cu.m./ha.), showed that the volume increment of mistletoe-infested trees is 19% less than that of the healthy trees.

2948. MARINKOVIĆ, P. R. Prilog poznavanju parazitne flore na šumskom drveću planine Stolova. [**Parasitic plants on forest trees on Mt. Stolovi [Serbia].**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (303–6). [Croat.f.]

Lists 50 fungi and green parasites.

443. Fungi and Bacteria

See also Nos. 2488–91, 2948, 3017, 3087, 3209.

2949. **Secretariat note on pests and diseases.** [*Docum.*] *8th Sess. FAO European For. Comm., Rome 1955*, No. *FAO/EFC*/87, 1955. pp. 30. [E.F.] Limited distribution.

Summarizes and tabulates information from member countries on forest diseases and insect pests reported during the year.

2950. BIRAGHI, A. Patologia delle piante forestali. Parte speciale. Malattie prodotte da virus, batteri e funghi. **[The pathology of forest plants. Special part. Diseases caused by viruses, bacteria, and fungi.]** Editrice Universitaria, Firenze. [*n.d.*] pp. 112. [It.]

Notes on the more important pathogens occurring in Italian forests.

Fungi and Bacteria: Natural and Biological Control

See also No. 3387.

2951. KRSTIĆ, M. **Prospects of application of biological control in forest pathology.** *Bot. Rev.* 22 (1), 1956 (38–44). 31 refs. [Forest Research Institute, Belgrade.]

A brief review of selected world literature bearing on the possibility of controlling tree pathogens and timber fungi by antagonistic fungi or bacteria, emphasizing the rudimentary state of present knowledge and the difficulties in the way of practical application. The best prospects for biological control appear to be in the temporary protection of logs in the forest or in storage.

Fungi and Bacteria: Chemical Control

See also Nos. 2726–30, 2733–5, 2902–4.

2952. GOKSØYR, J. **The effect of some dithiocarbamyl compounds on the metabolism of fungi.** *Physiol. Plant., Copenhagen* 8 (4), 1955 (719–835). 182 refs. [E.e.]

2953. RUSHDI, M., and JEFFERS, W. F. **Effect of some soil factors on efficiency of fungicides in controlling *Rhizoctonia solani*.** *Phytopathology* 46 (2), 1956 (88–90). 16 refs.

The results of laboratory tests made on 7 soil factors with 4 fungicides indicate that texture, pH, and organic-matter content modify fungicidal activity. Probably the degree of adsorption by the soil is the most important factor affecting the activity of soil fungicides, thus activity was not changed by any of 3 moisture levels or by increasing the temperature from 21° to 30° C., though the rise favoured linear growth in fungus free of fungicide.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See Nos. 2725–35.

443.3. Diseases of Older Stages

2954. ETHERIDGE, D. E., and CARMICHAEL, E. **Further observations on the occurrence of *Coryne sarcoides* (Jacq.) Tul. on Spruce in Alberta.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (3).

[Cf. *For. Abstr.* 16 (No. 1906).] Isolations from heartwood of decayed and apparently healthy Spruce gave relatively large numbers of cultures of *C. sarcoides* from the heartwood of healthy trees (7·1%). It is concluded that this fungus can colonize the wood of living trees independently of the presence of decay. It is suggested that it occurs in the roots of trees as a saprophyte, and extends progressively into the heartwood to colonize the pith.

2955. BAGCHEE, K., PURI, Y. N., and BAKSHI, B. K. **Principal diseases and decays of Oaks and other hardwoods in India—II.** *Indian Phytopathology, New Delhi* 7 (1), 1954 (18–42). 34 refs. H.S.B.

Lists, with annotations, more hymenomycetes on living and dead Oaks [cf. *For. Abstr.* 13 (No. 3980)]. Those reported for the first time in India are described in detail.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 2649, 2672, 2690, 2826, 2928, 3084–5.

2956. JØRGENSEN, E. Trametesangreb i læhegn. **[*Fomes annosus* infection in shelterbelts.]** *Dansk Skovforen. Tidsskr.* 40 (6), 1955 (279–85). 1 ref. [Dan.e.]

Infection in belts at three forest research stations, containing *Sorbus* spp., Thorn, Beech, and Sitka Spruce, separately or in mixture, probably originated from softwood fenceposts attacked by the fungus.

2957. WALLIS, G. W., and BUCKLAND, D. C. **The effect of trenching on the spread of yellow laminated root rot of Douglas Fir.** *For. Chron.* 31 (4), 1955 (356–9).

Experimental trenching (1 ft. wide and 1·5 ft. deep) round a plot infected with *Poria weirii*, and again round an isolation zone, was done in 1931, and observations made at intervals until 1951. The trench appeared to prevent the disease from spreading outside the plot, though new centres of infection did arise in the isolation zone at some distance away, presumably by air-borne spores.

2958. NOWACKI, M. J. A bracaatinga e os fungos apodrecedores de sua madeira. **[*Mimosa bracaatinga* and fungi attacking its wood.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (277–82). 7 refs. [Port.e.]

Among fungi attacking dead stumps of *M. bracaatinga* in the forest are: *Auricularia rosea*, *Lenzites* sp., *Amauroderma* sp., *Hymenochaete barkeleyana*, *Irpiciporus* sp., *Schizophyllum alneum*, *Cladoderris dendritica*, *Polystictus pinsitus* and *Stilbum* sp. Descriptions are given of the last 3 species.

2959. FERNANDES, C. TAVEIRA. A secção de estudos do castanheiro e a actividade nela desenvoluda em 1954. **[Section for studies on Chestnut and its work in 1954.]** *Estud. Inform. Serv. flor. aqüíc. Portugal* No. 55–C2, 1955. pp. 8 + 2 photos. [Port.] Limited distribution.

Contains reports of studies on the control of *Phytophthora* spp. including tree inoculation experiments.

2960. THOMPSON, G. E. **Decay of Oaks caused by *Hypoxylon atropunctatum*.** *Abstr.* in *Phytopathology* 46 (1), 1956 (29).

This fungus appears primarily on Oaks, throughout the U.S.A., as flat extensive stromata, producing first a conidial, later a perithecial stage. The sapwood becomes dark brown and water-soaked, then lightens in colour. Irregular black zones are usual and hyphae occur in all cells of affected wood. Isolates have been obtained from infected wood, and also ascospores—the colonies produced by the latter showing many variations. Conidia have not yielded cultures. On artificial media the optimum growth temperature is 30° C. Inoculations on living trees have demonstrated pathogenicity.

Wilts, Diebacks etc.

See also Nos. 2483, 2490–1, 2970.

2961. McMULLEN, L. H. **Insects and their relation to Oak wilt in Wisconsin.** *Abstr. of thesis*, in *Dissert. Abstr.* 15 (12), 1955 (2378). [University of Wisconsin.] O.R.S.

Insects (leaf-feeding and sap-sucking forms and barkbeetles) previously exposed to *Chalara quercina*, were caged on or crushed in wounds made in healthy Oaks. Other insects, chiefly Nitidulidae, allowed to walk over sporulating mats or cultures of the fungus, were caged on wounds in otherwise healthy Oaks. Wounds were also made at weekly intervals on healthy Oaks and left open for natural insect visitation; collections of Nitidulidae were made from these wounds and the trees were observed for evidence of the disease. Attempts were made to recover the fungus from insects. Stained endoconidia were used to determine whether tree-hoppers or barkbeetles could obtain the spores from the xylem vessels of Oak twigs. The only caging procedure giving positive results was that in which the insects were caged over the wounds. Peaks of infection in the period 1 May and 15 Oct., occurred in trees wounded and caged in June and August, both associated with high precipitation. In the series of Oaks wounded only, trees wounded between 15 May and 19 June wilted, and wilt was most frequent in trees wounded between 11 and 19 June; insects were most numerous on trees wounded at this time. *Coleopterus truncatus* was the commonest nitidulid on both wounds and mycelial mats. Four species were reared through their complete life cycle on cultures of the fungus. BHC and aldrin gave good kills of two species of Nitidulidae in the laboratory, but BHC applied to the trunk of wilting trees before mat formation, failed to prevent the entry of insects into the mats. [Cf. *For. Abstr.* 16 (No. 4246).]

2962. STAMBAUGH, W. T., FERGUS, C. L., CRAIGHEAD, F. C., and THOMPSON, H. E. **Viable spores of *Endoconidiophora fagacearum* from bark- and wood-boring beetles.** *Plant Dis. Reptr.* 39 (11), 1955 (867–71). 9 refs. A.P.B.

A spermatization technique devised by the authors showed that the beetles *Agrilus bilineatus*, *Xyleborus* spp., *Xyloterinus politus* and *Pseudopityophthorus* spp. carry viable spores of *E. fagacearum* on emerging from diseased portions of trees. [Cf. *For. Abstr.* 16 (No. 4243).]

2963. CAMPBELL, R. N., and FRENCH, D. W. **Moisture content of Oaks and mat formation by the Oak wilt fungus.** *For. Sci.* 1 (4), 1955 (265–70). 16 refs.

[Cf. *For. Abstr.* 16 (No. 1914).] Gives statistically supported data for the moisture content (m.c.) of the sap- and heartwood of healthy and diseased *Quercus ellipsoidalis* (60 trees) sampled during the dormant, budding, growing, and resting periods, the last being after the cessation of growth and before leaf-fall. In healthy trees the sapwood m.c. averaged 45·6% of the green weight during radial growth; during the rest of the year it fell to 40%. The m.c. of sapwood of trees wilted by *Endoconidiophora fagacearum* remained at the high level of healthy trees if mats were formed the same year, but fell to 41% if mat formation was delayed until the following spring.

2964. JONES, T. W., and BRETZ, T. W. **Radial penetration of the Oak wilt fungus into the boles of diseased trees.** *Plant Dis. Reptr.* 39 (11), 1955 (872). 3 refs. A.P.B.

Penetration in 11 wilt-killed trees was examined on increment cores. Each core was divided into 4 sub-samples consisting of: (1) the first 3 growth rings adjacent to the cambium, (2) the next 3 growth rings (i.e. those found 4th, 5th and 6th from the cambium), (3) the 3 rings of sapwood adjoining the heartwood, and (4) the 3 rings of heartwood adjoining the sapwood. *E. fagacearum* was isolated from only 148 of the 2216 sub-samples taken. Fifty-six of the positive isolations were from (1), 65 from (2), and 27 from (3). Maximum depth of recovery was the 10th annual ring from the cambium, and 32 mm. from it. The organism was not recovered from the heartwood. It is calculated that, although during and shortly after the period of foliar symptom expression the pathogen is limited to the outer sapwood of infected trees, by the time the killed tree is in a condition suitable for fungus-mat production, the organism may have invaded any part of the sapwood.

2965. DRAKE, C. R., KUNTZ, J. E., and RIKER, A. J. **Sapwood formation and infection by the Oak wilt fungus.** *Abstr.* in *Phytopathology* 46 (1), 1956 (11).

Traces the effects of the fungus on early-wood development, plugging and tylose formation, leafing, mortality etc., following various forms of wounding 50 Pin Oaks weekly (20 April–10 Sept. 1955), 45 of these being inoculated each week.

2966. TOOLE, E. R. **Performance of wilt-resistant Mimosa trees in high-hazard areas.** *Plant Dis. Reptr.* 39 (11), 1955 (874). A.P.B.

Survival of wilt-resistant clones of *Albizzia julibrissin* was 65% after 6 growing seasons. Most of the mortality was attributable to drought or injury. Two of the clones were released in 1949 under the names 'Tryon' and 'Charlotte'.

2967. BAKSHI, B. K., and SINGH, S.; BAKSHI, B. K. **Wilt disease of Shisham (*Dalbergia sissoo* Roxb.). 1. Introduction and host-parasite relationship. 2. Behaviour of *Fusarium solani*, the wilt**

organism, in soil. *Indian For. Rec* (*n.s.*) *Mycology* 1 (5), 1955. pp. 19 + 3 plates. 67 refs. *Repr.* from *Indian For.* 80 (6), 1954 (316–22); 81 (4), 1955 (276–81). [Cf. *For. Abstr.* 16 (Nos. 650, 4251).]

Cankers, Stem Rusts etc.

2968. ***Phomopsis pseudotsugae* Wilson.** *Distr. Maps Plant Dis.* No. 320, 1956. pp. [2]. [Commonwealth Mycological Institute, London.]

2969. WATERMAN, A. M. **The relation of *Valsa kunzei* to cankers on conifers.** *Phytopathology* 45 (12), 1955 (686–92). 19 refs. [Northeastern Forest Experiment Station, New Haven, Conn.]

An investigation of the *Cytospora* stages found in cankers and related *Valsa* stages on *Abies balsamea, Larix decidua, Picea abies, P. pungens, P. glauca, P. orientalis, P. rubens, Pinus strobus, P. wallichiana, Pseudotsuga taxifolia* and *Tsuga canadensis*, covered the microscopic examination of pycnidia and perithecia from all of these and from artificial cultures. Using the characters of the perithecial stromata as more constant for diagnosis, both stages of 3 varieties are described (photomicrographs, × 75), each a variety of *Valsa kunzei* to which the fungi of all hosts corresponded. Hosts of var. *kunzei* were the Fir, Douglas, Larch and Hemlock; of var. *piceae*, the Spruces; and of var. *superficialis*, the Pines. Inoculations of isolates of these 3 varieties on nursery trees of the same species and genera resulted in successful takes only with the first variety and only on Spruce and Douglas. The meagre positive results are ascribed to the healthy state of the test plants, which is contrasted with the usually poor state of the hosts in nature. [Cf. *For. Abstr.* 17 (No. 570).]

2970. QUIRKE, D. A., and HORD, H. H. V. **A canker and die-back of Balsam Fir in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (2).

The disease, of which the first visible symptom is a reddening of the needles followed by dieback of the affected branch and development of a canker on the stem below the branch, is apparently caused by a *Nectria* sp. It is most common on young reproduction and immature trees on the fringe of stands or in open-grown areas.

2971. DAVIDSON, R. W., and CASH, E. K. **A *Cenangium* associated with sooty-bark canker of Aspen.** *Phytopathology* 46 (1), 1956 (34–6). 6 refs.

Sooty bark canker of Aspen (*P. tremuloides*) is here reported for the first time (in the Central Rocky Mts.). The bark becomes blackened but remains intact over the cankered area, which is found up to 60–70 ft. up the trunk. In 3–5 years a discomycete, here named *Cenangium singulare* (Rehm.) *comb. nov.* fruits abundantly in the canker. It may appear in the centres of the cankers before they girdle and kill the tree but it is most abundant in the diseased bark of dead trees.

2972. SHEA, K. R., and KUNTZ, J. E. **Effective inoculation of Aspen with *Hypoxylon pruinatum*.** *Abstr.* in *Phytopathology* 46 (1), 1955 (26).

Culture fragments from 3 different media (*a*), and spore suspensions from natural cankers (*b*), were applied in vertical chisel cuts on 720 Aspens. These cuts were left open, covered with moist cotton, or (*c*) covered with masking tape. Method (*a*) with culture on a 3/1 oat/wheat mix, combined with (*c*), gave the highest infection rate—82%. All (*b*) inoculations were negative and all controls (cuts without inoculations) callused without infection.

2973. ***Endothia parasitica* (Murrill) Anderson and Anderson.** *Distr. Maps Plant Dis.* No. 66 (2nd ed.), 1955. pp. [2].

2974. SOMMER, N. F. **Sporulation of *Hendersonula toruloidea* in Persian Walnut [*Juglans regia*] xylem.** *Abstr.* in *Phytopathology* 46 (1), 1955 (27).

This fungus is associated with sunscald as the cause of a branch wilt disease of Walnut. Wounds without burns are unimportant entrance courts. When the cut ends of branches were submerged in spore suspensions, spores moved up the xylem 30 in. in 48 hours. Injections of intact uninjured branches only caused cankers if portions of the branch were exposed to the sun after injection. The role of internal sporulation in the spread of the disease remains undetermined. [Cf. *For. Abstr.* 17 (No. 1748).]

2975. DOMANSKI, S. Studium nad grzybem *Phellinus punctatus* (Fr.) Pilát ze szczególnym uwzględnieniem jego rakotwórczej działalności na jesionie. [***P. punctatus* and the formation of cankers on Ash.**] *Acta Soc. Bot. Polon.* 25 (1), 1956 (159–80). 26 refs. [Pol.e.] O.B.D.

The following conclusions are drawn: (1) The disease, which was more or less confined to the lower parts of the tree, caused a yellowish-white rot of the heartwood, attacked living sapwood, and killed the cambium and bark, forming a canker. (2) The annual rate of penetration of *P. punctatus* into the cambium and bark was: (*a*) below point of origin—1·3 to 4·2 cm., and (*b*) above it—1·6 to 4·2 cm. Corresponding data for the sapwood were, (*a*) 1·2 to 3·8 cm., and (*b*) 5·0 to 13·7 cm. (3) The cankered areas were spindle-shaped, attaining lengths of 0·34 to 2·71 m. and starting from a thin dead point. They produced a partial girdling effect and caused a spindle-shaped enlargement of the stem. (4) The formation of canker, its course and rate of development were dependent upon the individual resistance of trees to fungus penetration. (5) A relationship was found between annual canker spread and long winter frosts. (6) There were indications that lower twigs killed in winter were probably a source of fungus infection. *From author's summary.*

Foliage Diseases

See also No. 2691.

2976. GRASSO, V., and CAPRETTI, C. Un nuovo ospite di *Keithia tetraspora* (Phill.) Sacc. e prima segnalazione in Italia. [**A new host of *K. tetraspora* and the first record of its occurrence in Italy.**]

Ital. for. mont. 10 (6), 1955 (273–5 + 5 photos). 31 refs. [It.it.f.]

This fungus, not hitherto reported from Italy, was found causing defoliation of *Juniperus macrocarpa* in Leghorn province. It had previously been found on *J. oxycedrus*. A list is given of the coniferous hosts of other *Keithia* spp.

2977. MURRAY, J. S., and YOUNG, C. W. T. **The effect of brashing and thinning debris on the incidence of *Lophodermium pinastri*.** *Quart. J. For.* 50 (1), 1956 (75–6). [Forestry Commission Research Station, Alice Holt.]

To test the association of *Lophodermium* and branch debris, an area of Pine forest at Eversley, Hants, was surveyed in May 1955 and all infected areas of young Pine were marked on the map. It was then ascertained which compartments had been thinned or green-brashed in 1953 and early 1954, and these also were marked on the map. The results substantiated the opinion formed on inspection of the damage on the ground, that *Lophodermium* attack was most severe in young plantations where they adjoined older plantations that had recently been thinned. Closely spaced unbrashed trees formed an almost complete barrier to the spread of the fungus, while the top of a thinned tree fallen among young growth acted as a source of infection. Vertical distribution was as limited as horizontal. Young trees were much more severely affected than older ones, on which only the lower branches were affected.

2978. OLBERG, A. Über die Kiefernschütte *Lophodermium pinastri* Schrad. [***L. pinastri***]. *Forst- u. Holzw.* 10 (15), 1955 (307–8). [G.]

A general article on conditions favouring infection and degree of injury, chemical control, and silvicultural precautions.

2979. RACK, K. Über die Bedingungen und den Verlauf der Schütte-Infektion im Sommerhalbjahr 1954. [**The conditions affecting the course of *Lophodermium pinastri* infections in the summer half-year of 1954.**] *Forst- u. Holzw.* 10 (11), 1955 (224–5). 1 ref. [G.] [Niedersächsische forstliche Versuchsanstalt.]

Chiefly a first account of observations and experiments still in progress on the relationship between the development of apothecia and spores—and hence, best spraying times—and climatic conditions. Spore counts above a 4-year-old Pine plantation showed a fairly close correspondence between the rainfall and spore-density graphs. Best spraying results were obtained in early August, ca. 5 weeks after the appearance of the first ripe apothecia. Local differences due to site conditions and microclimate were considerable. In tests with 24 fungicides, only 1·5% Bordeaux mixture with double lime content, and 0·2% Dithan gave satisfactory results with single sprayings. With 2 sprayings, ordinary Bordeaux mixture and other preparations were fairly satisfactory.

2980. DENGLER, A. Schütteversuch mit finnischen und märkischen Kiefern. [**The resistance to *Lophodermium pinastri* of *Pinus sylvestris* from Finland and Brandenburg compared.**] *Arch. Forstw.* 4 (1), 1955 (4–8). [G.]

Presents data of trials replicated at Eberswalde and Helsinki with Pines and infection material of the 2 provenances, which show that the Finnish Pine is definitely more resistant to this leaf-cast. The conditions of the experiment rule out climate and virulence of fungal strain; the better resistance of the Finnish race must be inherent.

2981. MORIONDO, F. Formazione di ecidi interni da parte di *Melampsora pinitorqua* Rostr. [**Formation of internal aecia by *M. pinitorqua*.**] *Repr.* from *Ann. Accad. ital. Sci. for.* 2, 1954 (265–71). 8 refs. [It.f.]

Describes aecia of *M. pinitorqua* developed inside buds of *Pinus pinea* and attempts to explain the phenomenon.

2982. FERRÉ, Y. DE. Les *Pseudotsuga* de l'Arboretum de Joueou et leur résistance au *Phaeocryptopus*. [**The Douglas Firs at the Arboretum of Joueou and their resistance to *Phaeocryptopus*.**] *Trav. Lab. for. Toulouse* 6 (4) Art. 1, 1955. pp. 6. 3 refs. [F.]

Examination of Douglas Fir of several varieties and provenances led to the conclusion that the height rather than the age of the tree is a limiting factor in susceptibility to infection by *P. gäumanni*, trees < 1 m. high seldom being attacked. It is supposed that snow-cover usually attains that depth in the Pyrenees, and gives protection to small trees. Trees < 6 years old are seldom attacked, but this is probably because they are below the height of 1 m. There seems to be some evidence, however, that susceptibility is greatest between 10 and 25 years. On the whole the Rocky Mountain provenances (var. *glauca* and var. *caesia*) are much more susceptible than the coastal (var. *viridis*).

2983. ITO, K., and CHIBA, O. **Studies on some anthracnoses of woody plants.—II. *Glomerella* parasitic on *Paulownia* trees.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (43–62). 32 refs. [E.jap.]

A comparative study of *Gloeosporium kawakamii*, *Glomerella cingulata* and a form of *Glomerella*, probably grouped by present taxonomy with the second but proved here to have distinctive characters and not to be the perfect stage of the first named. The study covers morphology, physiology, pathogenicity and inoculation trials.

2984. BOND, T. E. T. **Notes on *Taphrina*.** *Trans. Brit. mycol. Soc.* 39 (1), 1956 (60–6). 11 refs. O.B.D.

T. tosquinetii on shoots and leaves of *Alnus glutinosa*. *T. ulmi* affecting leaves of Elms in Britain. *T. minor* causing leaf curl of *Prunus avium* and related species is accepted as identical with *T. cerasi* causing witches' brooms on the same hosts; *Prunus subhirtella* is cited as an additional host of *T. cerasi*. *From author's summary.*

444. Virus Diseases

See also No. 2950.

2985. RAMASWAMY, M. N. **Sandal spike—a plant virus disease.** *Indian For.* 82 (2), 1956 (70–3).

Reviews the present state of knowledge on spike disease of *Santalum album* and in the light of recent progress in plant virus research suggests future lines of investigation.

45. Damage by Animals

451. Mammals

See also Nos. 2432–4, 2744, 2929, 3209.

2986. KÄHLER, K. Jordrotters barkgnav paa askestammer. [**Barking damage to Ash stems by *Arvicola amphibius***.] *Dansk Skovforen. Tidsskr.* 39 (4), 1954 (217–22). [Dan.]

Describes damage caused within a few days in Aug. 1952, to Ash 6 years after planting. Most trees were barked, many completely, to heights ranging from 5 to 23 cm. Compares the damage with that to an Ash stem put in among beavers at the State Experimental Farm at Trollesminde.

2987. BJEGOVIĆ, P. Masovna pojava vodene voluharice na Gročanskoj Adi. [**Mass appearance of the vole *Arvicola terrestris* on the island of Gročanska Ada [, Serbia].**] *Zašt. Bilja* No. 25, 1954 (92–5 + 2 plates). 4 refs. [Croat.e.] I.M.I.

An outbreak in 1952–53 on this island in the Danube caused considerable damage to maize and to young forest plants, especially *Populus canadensis*, *Fraxinus americana* and *Acer negundo*, and also to *Morus alba*. Good control was obtained by wheat bait poisoned with Zn_3P_2.

2988. DIEKERT, K.-H. Versuch zur Erprobung von 'Ohlsen's Auslegerohr für Giftweizen'. [**Trials with Ohlsen's tunnel for the application of poisoned wheat.**] *Forst- u. Holzw.* 10 (6), 1955 (115). [G.]

A device consisting of a small tin dish fixed inside a tunnel-shaped piece of sheet metal was lighter and handier than the earthenware drain-pipes commonly used, and kept the bait dry longer; but more bait was taken from the drain-pipes. Ordinary used food tins proved inferior to both.

2989. BANG, P. Bekæmpelsesforsøg med musegiftkorn. [**Experiments in controlling mice with poisoned grain.**] *Dansk Skovforen. Tidsskr.* 39 (11), 1954 (612–7). [Dan.]

Experiments over a period from Oct. 1952 to April 1953, in a young Beech plantation, laying down wheat treated with 2 commercial preparations (one a pyrimidine derivative, the other 5% Zn_3P_2 and 1% α-naphthylthiourea) showed that these failed to prevent mouse damage in spite of their laboratory-tested lethal effect. The treated grains were only removed in large quantities at the beginning of the experiment, and when untreated grain was put down it was preferred.

2990. HIGUCHI, S. [**On the effect of control by rodenticide 'Warfarin' in the field.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (75–80). 13 refs. [Jap.jap.e.] (Also in *Rep. For. Exp. Sta., Hokkaido* No. 7, 1955 (75–80).)

In a valley strip, the favourable habitat of *Clethrionomys rufocanus bedfordiae* and a centre of infestation for neighbouring plantations, two plots were laid out, (*A*) restricted along its length by a road and a railway, (*B*) with uninterrupted access up the slope to plantations. Over the area > 80 bait stations were laid and the consumption of bait (Warfarin plus corn meal) was noted daily for 13 days. A curve of the average consumption per station showed for both plots a peak at 2–3 days but only (*B*) (with access up the slope) had subsidiary peaks at the 7th and 9th days. It is believed that these subsidiary peaks represent re-invasions from the perimeter and that the road was sufficient barrier to prevent the appearance of similar peaks in the curve for (*A*). It is contended that control of the pest would therefore be effective if this poison were used and the centres of infestation treated.

2991. SCHINDLER, U. Neue Wege in der Erdmausbekämpfung. [**New methods in the control of *Microtus agrestis***.] *Repr.* from *Desinfektion und Gesundheitswesen* [, *Staufen i. Br.*] Nov., 1955. pp. 1. 11 refs. [G.] [Niedersächsische Forstliche Versuchsanstalt.]

Toxaphene and endrin (both chlorinated hydrocarbons), used at 5 times the rate of insecticides, have been successful in controlling field-mice. Application by spraying grass and ground cover is recommended, at the rate of 1·7 kg. endrin or 6 kg. toxaphene in 400 litres water/ha., at a cost of DM. 36–42. Dusting is more expensive, needing e.g. 80–100 kg. toxaphene dust/ha., and should be used only in forest areas where water supplies would be difficult. No injury to deer, birds or domestic animals has been recorded, but until more thorough tests have been made the application should be confined to areas fenced against deer, and dogs should be kept away for about a month. Fish are very susceptible and the chemicals should be kept away from rivers.

2992. GUTSCHE, H. J. Versuche der Mäusebekämpfung. [**Experiments in the control of mice.**] *Forst- u. Holzw.* 10 (6), 1955 (115–7.) [G.]

An analysis of mice trapped over 3 years in plantations showed that in the forest interior 86% belonged to the species *Microtus agrestis*, which does not accept poisoned wheat. The building of 'mouse refuges' of sticks and poisoned dry hay, covered with roofing felt is suggested. The poison from the hay would get on to the coats of the mice and thence into their system. It is claimed that, properly constructed, these 'refuges' constitute no danger to game or to mice predators [no results are given].

2993. **Foresters battle porcupines which are ravaging timber crops in Ponderosa Pine region of Northwest.** *Lumberm.* 82 (13), 1955 (78–9, 123). 8 refs.

Discusses the nature of the damage and its recognition, a survey of the extent of damage at the J. Neils Lumber Company's tree farm in S.W. Washington, and control by shooting or baiting, with details of 'bait blocks' successfully used.

2994. LUTZ, H. J. **Damage to Paper Birch by red squirrels in Alaska.** *J. For.* 54 (1), 1956 (31–3). 5 refs.

Describes, with photographs, damage done, most probably by *Tamiasciurus hudsonicus*, to *Betula papyrifera*, and gives transect data showing that it may cause serious mortality locally. The typical ½-in. wide girdling is attributed to the characters of the bark, which does not easily strip downwards. Number of trees damaged increases with diameter class, and outbreaks may be associated with heavy Spruce seed-years.

2995. TEMPLIN, E. Abwehr der Hasen- und Wildkaninchenschäden mit mechanischen und chemischen Mitteln. **[Control of damage by hares and rabbits by mechanical and chemical means.]** *Wald* 2 (12), 1952 (356–8). 2 refs. [G.]

Describes experiments in Eberswalde and in heavily infested areas, chiefly on the effectiveness, phytotoxicity, and costs of various commercial or home-made repellents, many of which proved harmful to young plants.

2996. ANDREASSON, T. Om skydd mot viltskador: en redogörelse för några försök med kemiska medel. **[Protection against damage by wild mammals: a report on experiments with a chemical product.]** *Skogen* 43 (1), 1956 (10–1). [Sw.]

A new repellent, Wiltex, developed by Gullviks Fabrik AB, has been tested in S. Sweden. In tests with 2 + 2 Spruce sprayed after planting in Dec. 1953, in an area having large populations of rabbits, hares, and deer, 100% of untreated plants, 23% of those sprayed lightly on one side, 9% of those sprayed normally on one side and none of those sprayed on both sides, had been damaged by 3 May 1954. Figures for dead plants in the various categories by 20 Aug. 1954 were 16·7, 1·7, 3·3 and 2·5% respectively and for mean height by Oct. 1955 22·6, 37·1, 41·0 and 40·2 cm.; mortality among the treated plants is attributed to late planting, not to damage from animals. Field tests in a number of districts in Skåne showed that Wiltex gave almost complete protection to Pine and Spruce against rabbits, hares and deer, and when sprayed on the stem gave promising results in protecting hardwoods against mice. Preliminary results of spraying Pine against elk were also promising. All spraying should be done in autumn after the top shoot has lignified, and when the plants are dry. One-side spraying is sufficient to control browsing. Wiltex retains its effect for some years, but the new top shoots should be sprayed until the plant is above the critical size. Costs for Spruce are estimated at 0·9 öre per plant, equally divided between cost of labour and of chemical. Costs for a spacing 1·5 × 1·5 m. would be about Kr.40/ha.

2997. SKUDE, M. Forsøg vedrørende beskyttelse af planter i skoven mod vildtskade uden anvendelse af kulturhegn. **[Investigations on protecting plants in the forest against damage by wild mammals without fencing.]** *Dansk Skovforen. Tidsskr.* 39 (2), 1954 (63–92). 7 refs. [Dan.]

Tar (usually diluted with an equal quantity of crude C_6H_6) was almost invariably successful in controlling damage by deer, hares and mice to young plants (including Beech, Oak, Norway Spruce, *Abies* spp., *Pseudotsuga taxifolia*). Spraying damage was slight. In studies on spraying individual trees, with different degrees of spray deposition, needles and buds of conifers were often killed by the heavier sprays, and bud shooting was delayed. If heavy spraying is necessary it should be confined to only part of the plant. Height growth is not affected if some or all of the side buds are killed. Results are given in a summary table; also some indication of spraying costs. Research on the effects of different types of tar is continuing.

2998. TÜRKE, F. Untersuchungen über chemische Mittel zur Verhütung von Wildschäden im Walde. **[Tests with chemical repellents to control game [chiefly deer] damage in the forest.]** *Abstr.* in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 1, 1954 (92–5). [G.]

About 50 preparations were tried and suitable testing methods evolved. Of the general repellents by odour only, Anthropin, imitating the smell of humans, was markedly superior. Of the preparations to prevent browsing and bark-scaling only 6 could be said to be effective, and of these, only 3 were not phytotoxic. Brush application is cheaper than, and usually preferable to, spraying.

2999. LIEBENEINER, E. Zur Aufbringung und Wirkung von Wildverbissmitteln. **[On the application and effectiveness of game repellents.]** *Forst- u. Holzw.* 10 (1), 1955 (9–10). [G.]

In a repetition of trials with repellents in strips alternating with untreated rows [cf. *For. Abstr.* 15 (No. 2654)] the mode of application was also varied. Of the methods tested, Bergner's 'plier brush' [cf. *For. Abstr.* 12 (No. 3412)] proved best for conifers. Arbinol applied in this manner reduced browsing on 1-year-old Douglas Fir to 7% of that on controls (where 59% of the plants had suffered) and on 2-year Spruce, grown in mixture with it, to 3% of that on controls (54%). Application with Flügel's pump was less successful, particularly when Dendrocol was used, and a 'Flit' sprayer was unsatisfactory. For *Quercus borealis*, only Spangol applied with the 'Spitzenberg' container, had any effect. There were drawbacks to all methods of application, and costs were high.

3000. RACHOR, F. Einzelpflanzenschutz 'Waldfreund'. **[The 'Waldfreund', a protection for individual plants.]** *Forst- u. Holzw.* 10 (23), 1955 (487). [G.]

Describes and illustrates a device resembling a giant paper-clip, 14 cm. long, made from special 1·8-mm. wire, which is clipped on to the leading shoots of plants as a protection against game. It is claimed that it is so light and flexible as not to harm the tenderest shoot, that it gives way as the shoot grows, and never grows in. It can be used repeatedly and is stated to be very cheap.

3001. JÄHRIG, H. Sind Wildschäden im Wald unvermeidlich? **[Is game damage in the forest**

unavoidable?] *Forst- u. Holzw.* 11 (2), 1956 (34–6). [G.]

Lack of food, a main cause of excessive damage, could be relieved by planting fodder crops such as cereals, maize, lupins, sunflowers, and root crops (e.g. Jerusalem artichokes) on fire-breaks, clearings, and other lands after suitable fertilizing. This would often make expensive fencing unnecessary.

3002. ARNBORG, T. Skador på tallplantor inom ett starkt renbetat område i Hede socken. [**Damage to Scots Pine plants in a district heavily grazed by reindeer in Hede parish.**] *Norrlands SkogsvFörb. Tidskr.* 1955 (4), (363–87). 7 refs. [Sw.]

Four plots in areas clear-felled in 1936 were examined in 1954. Results are given in graphs and tables showing numbers of Pines undamaged or suffering damage in different degrees, and number of Pines with damage caused by (*a*) reindeer, (*b*) reindeer and other causes, and (*c*) other causes. Combined results for the 4 plots show that in the total material 73·4% of Pines were undamaged or were capable of developing; among plants > 10 cm. high the figure was 37·5%. Of the dead plants and those incapable of developing, 36% of the total and 27·9% of those > 10 cm. high had been damaged by reindeer, 5·7 and 12·1 by reindeer and other causes, 7·3 and 15·6% by insects, 9·5 and 20·4 by fungi, 1·0 and 2·2 by fungi and insects together, 0·3 and 0·6 by elk, and 19·5 and 10·5 by other agents, while 20·7 and 10·7% were undamaged but of poor quality and unlikely to live. These figures show that reindeer damage is an important factor in the unsatisfactory regeneration in the area. Injury from the hooves was the main source of reindeer damage in plants up to 11 years, and this continued, but with injury from rubbing with the horns increasing and causing heavy mortality, in the older plants. Other Scandinavian literature is discussed.

3003. ERTELD, W. Die Durchmesser- und Massendifferenzen zwischen geschälten und ungeschälten Fichten bei Kluppung in Brusthöhe. [**Differences in diameter and volume from breast height calipering of Norway Spruce undamaged and damaged [by deer].**] *Arch. Forstw.* 3 (7/8), 1954 (706–16). 7 refs. [G.g.]

For the calculation of the diameter and volume of deer-damaged Spruce, where calipering at or conveniently near breast height (1·3 m.) is precluded by stem deformity, the diameter was calipered at 1·3 m. and at 3 m. and 5 m. (in part at 1·8 m.) on 252 damaged stems, 61 years old. By reference to the height curves of Wiedemann's yield tables and Mitscherlich's taper series, the normal b.h. diameters corresponding to those at 3 m. and 5 m. were found. A table is given for finding the % reduction of diameter and volume for diameters measured at 1·3 m. on damaged stems, ranging from 15 to 33 cm., and for 3 degrees of damage (exaggeration of diam. 0–4, 4–6 and over 6 cm.). The volumes are reliable for normal height growth. Where deformation is not excessive, measurement at 1·8 m. instead of 1·3 m. gives a high degree of accuracy.

3004. WILLIAMS, R. W. M. **Study of deer fencing and changes induced in vegetation—Alton Valley.** *N.Z. J. For.* 7 (2), 1955 (56–62). 3 refs.

In the management of Silver Beech [*Nothofagus menziesii*] production forest in the Alton Valley, 2580 acres, comprising mostly virgin forest, have been ring-fenced as an experimental project to protect new regeneration against red deer. Notes are given on the design and construction of the fence, the examination of its effectiveness, and the progress made in deer elimination. A series of line-plot belt transects which have been laid out across the fence line for study of changes in the vegetation are also described. An outline is given of the data recorded during the two years since the fence was completed; these lend emphasis to the need for the total elimination of the deer still remaining inside. *Author's summary.*

3005. [**Monkey damage to Pines.**] *Rep. For. Dep. Mauritius 1954*, 1955 (6).

The damage caused by monkeys in Pine plantations [probably *Pinus caribaea* s.l. and *P. taeda*] has necessitated the organization of regular shoots. They have the habit of feeding on the tender bark of tree tops, and thus crops of all ages are vulnerable. Severe damage may kill the tree top, and in any case imparts a spiral twist to the upper portions of the stem. In a detailed survey of the damage caused by high winds in Pine plantations, it was found that almost every tree with a broken top had at some time been damaged by monkeys, and that tops always snapped at such points of damage. Very few trees not damaged by monkeys were injured by high winds.

452. Birds

See No. 3033.

453. Insects

See also Nos. 2421–9, 2949, 2961–2, 3144.

3006. SCHWERDTFEGER, F. Forstentomologische Probleme in Jugoslawien. [**Problems of forest entomology in Jugoslavia.**] *Anz. Schädlingsk.* 29 (2; 3), 1956 (17–20; 33–8). 57 refs. [G.]

A review with references to recent literature.

3007. TOMIĆ, D. Štetni insekti planine Zlatar u 1952 godini. [**Insect pests on Mt. Zlatar in 1952.**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (291–302). 5 refs. [Serb.serb.f.]

Lists 34 particularly dangerous insect pests found on Spruce, Silver Fir, Pine, Beech and Birch.

3008. ZAŠEV, B. Novi nasekomni vrediteli po gorskite dărveta i hrasti v Bălgarija. [**New insect pests of forest trees and shrubs in Bulgaria.**] *Nauč. Trud. lesoteh. Fak. selskostopan. Akad., Sofia* No. 1, 1952 (121–8). 7 refs. [Bulg.russ.]

Lists 70 insect pests, new for Bulgaria, found on *Betula alba*, *Ulmus* spp., *Fagus sylvatica*, *Pinus sylvestris*, *Salix* spp., *Carpinus betulus*, *Crataegus* sp., *Cornus* sp., *Quercus* sp., *Alnus glutinosa*, *Pistacia terebinthus*, *Corylus avellana*, *Tilia* spp., *Lonicera* sp., *Tilia* sp., *Populus* spp., *Euonymus* spp., *Acer* spp. and *Fraxinus* spp.

3009. SZMIDT, A. Analiza odporności żołędzi *Quercus pedunculata* Ehrh., *Quercus sessilis* Ehrh. i *Quercus borealis maxima* Ashe (*Q. rubra* Du Roi)

na uszkodzenia przez szkodniki owadzie. [**Analysis of the resistance to insect attack of the acorns of *Q. robur, Q. sessiflora* and *Q. borealis maxima.***] *Roczn. dendrol. polsk. Tow. bot., Warsz.* 10, 1955 (517–20). 5 refs. [Pol.]

Macroscopic inspection of > 60 kg. of acorns and dissection of another 19,000, showed *Q. borealis* acorns to be more resistant to attack by insects than those of the other two species, the resistance of which was found to be practically equal.

3010. MOSSOP, M. C. **Report of the chief entomologist for the year ending 30th September, 1954. Pests of forest and ornamental trees [in S. Rhodesia].** *Rhod. agric. J.* 52 (6), 1955 (521–3). E.M.B.

A borer attacking young shoots of *Erythrina caffra* in the Salisbury area was identified as *Terastra meticulosalis*. Pruning and spraying with a commercial mixture of DDT and parathion gave good control. Stacked *Eucalyptus saligna* timber was found to be damaged by the imported cerambycid *Phoracantha semipunctata*, the infestation having almost certainly occurred before the wood was cut into planks. With the drying of the planks the tunnels were revealed by shrinkage or loss of the 'sawdust' with which they were packed. *Phymateus viridipes* was very abundant in the immature stage in late summer. Only aldrin and dieldrin have so far proved effective in killing adults of this species. So far, also, in every district in which the Eucalyptus snout beetle (*Gonipterus scutellatus*) has been found, the mymarid wasp parasite, *Anaphoidea nitens*, introduced from Australia into S. Africa in 1926, has been found with it.

3011. PREBBLE, M. L. **Entomology in relation to forest protection in Canada.** *For. Chron.* 31 (4), 1955 (314–23). 36 refs. [Paper presented to the annual meeting of the Canadian Institute of Forestry, 1955.]

Describes certain aspects of forest insect surveys, research, and control methods, with a select bibliography of papers relating to forest insect control in Canada.

3012. SHENEFELT, R. D., and BENJAMIN, D. M. **Insects of Wisconsin forests.** *Circ. Wis. Coll. Agric. Ext. Serv.* No. 500, 1955. pp. 110.

3013. SPEERS, C. F. **Insects which attack Pine seedlings in the South.** *Sth. Lumberm.* 191 (2393), 1955 (147–51). 5 refs.

An account of damage by, control of, and research on *Hylobius pales*, *Rhyacionia frustrana*, *Neodiprion* spp., *Phyllophaga* spp., and *Tetralopha robustella*.

3014. MORRIS, R. C. **Insect problems in Southern hardwood forests.** *Sth. Lumberm.* 191 (2393), 1955 (136–9).

A general article, outlining future lines of research, with a table showing types and outer signs of damage by host species, and (where known) by insect, with notes on the economic importance of the latter and areas where they occur.

3015. PINHEIRO, J. VIEIRA. Contribuiçao para o conhecimento de insetos dos eucaliptais no Brasil. [**Insects of the Brazilian Eucalypt forests.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (330–9). 6 refs. [Port.e.]

A list, covering 70 genera, of species found in association with Eucalypts.

3016. ZECK, E. H. **Insect notes [, New South Wales].** *Agric. Gaz. N.S.W.* 65 (6; 11), 1954 (298; 583, 585); 66 (1; 3; 5; 6), 1955 (34–6; 154–5; 263; 295–6). I.M.I.

Brief notes on the following and their control: *Eriococcus coriaceus* on Eucalypts; *Pulvinaria maskelli* on *Atriplex* spp. and *Rhagodia* spp.; *Antheraea eucalypti* on Eucalypts, *Tristania conferta* and *Schinus molle*; *Cryptes baccatus* on *Acacia* spp.; *Orthorrhinus cylindrirostris* on orchard trees, *T. conferta*, *Castanospermum australe* and Eucalypts; *Cardiaspina artifex* on Eucalypts; *Icerya purchasi* on *Acacia* spp., *Ficus* spp. and ornamentals; *Aesiotes leucurus* on *Cupressus*, *Callitris* and *Pinus* spp.; and buprestids (*Diadoxus* spp.) on *Cupressus* and *Callitris* spp.

3017. RAWLINGS, G. B. **Epidemics in *Pinus radiata* forests in New Zealand.** *N.Z. J. For.* 7 (2), 1955 (53–5). 7 refs.

Brief notes on outbreaks of *Pineus börneri*, *Hybernia indocilis*, *Sirex noctilio*, *Lecanium hesperidium* var. *pini*, *Selidosema suavis*, and *Ctenopseustis obliquana*; and 3 species of fungus—*Diplodia pinea*, *Phomopsis strobi* and *Lophodermium pinastri*.

3018. DUN, G. S. **Economic entomology in Papua and New Guinea, 1948–1954.** *Papua N. Guinea agric. J.* 9 (3), 1955 (109–19). E.M.B.

Minor trials have been made in the protection of young seedlings from the giant snail with metaldehyde in sawdust; in the control of the Teak moth, *Hyblaea puera*, with DDT and BHC; and of mole crickets, [*Gryllotalpa africana*?], with chlordane.

Insects: Natural and Biological Control

See also Nos. 3010, 3032, 3034, 3036, 3042, 3062–3, 3066, 3075–8.

3019. SABROSKY, C. W. **The interrelations of biological control and taxonomy.** *J. econ. Ent.* 48 (6), 1955 (710–4). 7 refs.

A plea for greater co-operation between researchers in biological control and taxonomists, with examples (some of forest interest) of success or failure where such co-operation has been present or wanting. Co-operation should cover the planning of parasite introductions or transfers; surveys; preservation of samples (pests and parasites); and the establishment of the homogeneity of the populations studied. The chief contribution of the taxonomist is the organization and cataloguing of knowledge of species, in which he is often considerably assisted by control studies.

3020. FRANZ, J. Die gegenwärtige Situation der biologischen Schädlingsbekämpfung in Deutschland. [**The present situation in Germany with regard to the biological control of pests.**] *Anz. Schädlingsk.* 29 (2; 3), 1956 (20–4; 38–41). 78 refs. [G.]

A summary, based on literature, including a section on forest pests.

3021. SCHMIDT, G. Die Bedeutung der Spinnen für den Holzschutz. **[The role of spiders in timber protection [against insect attack in the forest].]** *Holz-Zbl.* 82 (21), 1956 (273–4). [G.]

A general article, with many illustrations and examples of German species, stressing the importance of spiders in the ecological balance of forest communities, the need for silvicultural measures favouring their habitats (e.g. bushes and herbaceous plants) and the need for further research into predator/food relationships.

3022. HERBERG, M. Vogelhege im Walde. **[Fostering birds in the forest.]** *Wald* 3 (2), 1953 (59–61). [G.]

Describes work in the bird sanctuary at Steckby [Saxony] where experiments with nesting boxes (now about 3–4 per ha.) have been in progress since 1926 in a Pine heath forest. Periodic samplings in December showed fewer Pine insect larvae and chrysalids than in similar stands elsewhere. Apart from nest boxes, access to water is the most important need of forest birds; winter feeding is considered less important.

Insects: Physical Control (General)

See No. 3044.

Insects: Chemical Control (General)

See also Nos. 2902–4, 3035, 3041, 3045–6, 3050–1, 3053, 3056–7, 3059, 3070, 3079, 3494.

3023. METCALF, R. L. **Organic insecticides: their chemistry and mode of action.** Interscience Publishers, Inc., New York. 1955. pp. x + 392. Many refs. Price £3. 8*s*.

3024. WOLLERMAN, E. H., REESE, C. R., and KIEFER, A. S. **Control of Black Locust insects by systemics.** *J. econ. Ent.* 48 (6), 1955 (760–1). 4 refs.

Illustrates the value of bioassays for the rapid screening of systemic insecticides. BHC, alpha-beta cake (by-product in making lindane), lindane [γBHC], Demeton and Schradan were watered or mixed with sand and buried about the roots of 16-month *Robinia pseudoacacia* plants. Demeton was the most toxic to the test animals (a microcrustacean and a membracid) in this pilot trial.

3025. **Resistance of insects to insecticides.** *Nature, Lond.* 177 (4504), 1956 (355–7).

Summarizes the papers read at a symposium held in London on 9 Jan. by the Association of Applied Biologists and the Society of Chemical Industry, on the following subjects: Variations in resistance to insecticides that normally occur throughout the life cycle of the insect (*C. Potter*); Effect of temperature on the toxicity of insecticides (*A. H. McIntosh*); Susceptibility to insecticides of laboratory cultures of an insect species (*J. H. Holborn*); Occurrence and status of insecticide-resistant strains (*J. R. Busvine*); Absorption and metabolism of BHC in normal and resistant houseflies (*F. R. Bradbury*); and Biochemical factors in the natural and acquired tolerance of insects to insecticides (*F. P. W. Winteringham*).

3026. DOBROVOLJSKIĬ, B. V. O himičeskom metode borjby s nasekomymi, vredjaščimi rastenijam v počve. **[Chemical control of insect pests damaging plants in the soil.]** *Vestnik Moskovskogo Universiteta* 1954 (9), (17–22). [Russ.] From *abstr.* in *Referat. Ž. (Him.)* 1955 (10), (No. 19244). [Russ.] P.O.

12% BHC effectively controls the soil-inhabiting insects that damage acorns and Oak seedlings.

Isoptera

3027. ROONWAL, M. L., and SEN-SARMA, P. K. **Biology and ecology of oriental termites (Isoptera). No. 3. Some observations on *Neotermes gardneri* (Snyder) (family Kalotermitidae).** *J. Bombay nat. Hist. Soc.* 53 (2), 1955 (234–9 + 2 plates). 7 refs. O.R.S.

N. gardneri has been found in Dehra Dun boring into the heartwood and sapwood of the following species: *Artocarpus lakoocha*, *Litsea polyantha*, *Mangifera indica*, *Pterospermum acerifolium* and *Woodfordia fruticosa*. Usually dead wood is attacked, but where this adjoins living, healthy wood, the attack spreads to the latter. No death of trees has so far been reported. Notes on the habits of the termite are presented. [Cf. *For. Abstr.* 16 (No. 3179).]

Hemiptera

See also Nos. 2423, 2688.

3028. CUMMING, M. E. P. **Adelgid galls [on conifers] in the Prairie Provinces.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (2).

Notes on *Chermes* [*Adelges*] *cooleyi*, *C. lariciatus*, *C. strobilobius*, *Pineus pinifoliae* and *P. similis*, their distribution and hosts.

3029. SCHINDLER, U. Erforschung der forstwirtschaftlichen Bedeutung der Buchenwollschildlaus (*Cryptococcus fagi* Baer) sowie Erarbeitung wirksamer Bekämpfungsmassnahmen. **[Investigations on the importance of *C. fagi* in forestry, and on effective methods of control.]** *Repr.* from *Forschungsergebnisse zur Förderung der forstlichen Erzeugung, Bundesministerium für ELF (AID), Hiltrup (Landwirtschaftsverlag)* 1955 (78–82). 5 refs. [G.]

Describes observations at the Niedersächsische Forstliche Versuchsanstalt on the symptoms and development of bark disease of Beech [cf. *For. Abstr.* 14 (No. 1390)]; the extent of damage by *C. fagi* and secondarily, in badly attacked trees, by *Hylocoetus dermestoides*, *Xyloterus domesticus*, and *Anisandrus dispar*; and mechanical and chemical control.

3030. **Felted Beech coccus.** *Leafl. For. Comm., Lond.* No. 15, 1956. pp. 8. Price 6*d*.

A general account of *Cryptococcus fagi*, its life history, association with *Nectria* fungus, and control measures.

3031. ***Pulvinaria psidii* (green shield scale, Guava mealy scale).** *Distr. Maps Insect Pests (Ser. A).* No. 59, 1955. pp. [2]. [Commonwealth Institute of Entomology, London.]

3032. GROVES, G. R. **The Bermuda Cedar.** *Unasylva* 9 (4), 1955 (169–72).

Gives an account of *Juniperus bermudiana*, the devastating insect attacks of recent years, attempts at biological control, and the proposed use of dead trees to make excellent chipboards. [Cf. *For. Abstr.* 16 (p. 595).]

Lepidoptera

See also Nos. 2424–6.

3033. TINDALE, N. B. **On a new species of *Oenetus* (Lepidoptera, family Hepialidae) damaging *Eucalyptus* saplings in Tasmania.** *Transactions of the Royal Society of South Australia, Adelaide* 76, 1953 (77–9 + 1 plate). L.S.

A new moth of the family Hepialidae, *Oenetus paradiseus* Tindale, is described from Tasmania where it has been found causing some damage to *Eucalyptus* saplings. The damage is accentuated by the injuries caused by black cockatoos (*Calyptorhynchus funereus*), when they are feeding on the larvae and pupae of the moth. Interaction of moth and cockatoo evidently plays an important part in the natural culling of sapling Eucalypts. A second race of the same species, *Oenetus p. montanus* Tindale is recorded from Snow Gums (*Eucalyptus niphophila*) on Mt. Gingera in the Federal Capital Territory. *Author's summary.*

3034. WEBER, P. *Eutrichonemis simploniella* F. R. (Lep., Gracilariidae) Rindenminierer an der Edelkastanie (*Castanea sativa* Miller). [***E. simploniella*, a bark-miner of *C. sativa*.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 31 (2), 1955 (345–8 + 7 photos). 6 refs. [G.]

A study was made of this insect in the Chestnut stands of the Ticino, where it was found to be widespread in pole stands. Its development, tunnels, and signs of its presence are described. It was found that 50% of the larvae sampled were parasitized, the chief parasites being *Pimpla alterans*, *Ephialtes* sp., *Hemiteles submarginatus*, and *Gelis corruptor*.

3035. WEBB, F. E. **Biological assessment of aerial forest spraying against the Spruce budworm in New Brunswick. I. Timing of operations 1952–54.** *For. Chron.* 31 (4), 1955 (342–52). 19 refs.

The aerial spraying operations in New Brunswick against the Spruce budworm have involved large areas in which tree mortality was imminent. In working out practical methods of timing applications, consideration has been given to the protection of foliage as well as to the immediate reduction of budworm populations. Modifications in operational techniques to lower spraying costs and increase area coverage have necessitated earlier spraying and lighter dosages. Factors considered in the timing include severity of infestation and defoliation, probable amount of spraying weather available, phenological differences between areas, the feeding habits of the budworm, and the tendency of spray to drift. The assessment of development was accomplished mainly by ground studies at representative locations and extended to the area at large by aerial surveys of Balsam Fir shoot growth.

An analysis is made of spraying effectiveness in relation to timing from field data collected for studying the immediate results. From this, estimates are given of the average number of days during which various levels of rated effectiveness are attainable. *Author's abstract.*

3036. MÜNZBERG and SCHÜTTE, F. Untersuchungen über das Schadauftreten und die Möglichkeiten der Bekämpfung des Eichenwicklers (*Tortrix viridana* L.) 1950/53. [**The outbreak of *T. viridana* and experiments in its control in 1950–53.**] *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 1, 1954 (115–22). [G.g.]

Investigations in the region of Munster, Westphalia, showed that in 1951 and 1952 ca. 30% of the total Oak areas were practically or totally defoliated. From a comparison of adjacent susceptible and resistant stands it is concluded that the resultant loss of increment amounts to about 33% or 1·9 cu.m./ha. The freshly hatched larvae preferably attack newly opened buds and outbreaks occur when weather conditions are such that hatching and flushing coincide. Late flushers are less frequently attacked than early flushers, and a very late flushing, and hence resistant, stand was found at Caldenhof. Experimental spraying with mobile and portable equipment were inconclusive and experiments with increased bird populations were disappointing. [Cf. *For. Abstr.* 1 (p. 297).]

3037. SCHOPMEYER, C. S., and SMITH, R. H. **Pitch moth damage to Slash Pine.** *Naval Stores Rev.* 65 (9), 1955 (6).

An insect identified as *Dioryctria* sp. has caused noticeable damage to young Slash Pine in Baker County, Florida. The damage is associated with mechanically made wounds, such as pruning scars and resin streaks. Larger trees do not appear to suffer greatly, but smaller trees (3–5 in d.b.h.) have been killed. The type of damage is described. Infestations seem to have been controlled by spraying the wounded portion of the bole with a light dosage of a 1% solution of γBHC in diesel oil.

3038. ***Artona catoxantha* (Hmps.) (Coconut leaf moth).** *Distr. Maps Insect Pests (Ser. A).* No. 55, 1955. pp. [2]. [Commonwealth Institute of Entomology, London.]

3039. BARTER, G. W., and CAMERON, D. G. **Some effects of defoliation by the forest tent caterpillar.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (1).

An outbreak of *Malacosoma disstria* occurred in New Brunswick during 1941, 1950, and 1951. Radial growth of Aspen [*Populus tremuloides*], which was almost totally defoliated, was reduced during each year of defoliation but did not cease immediately upon loss of foliage. Reduction of radial growth for the three years 1949–51 respectively amounted to 42, 52, and 77%. Some recovery of growth rate occurred in 1952, but the growth that year was still below normal and about the same as that of the first year of the outbreak. Radial-growth reduction of White Birch [*Betula papyrifera*?] amounted to 22, 68 and 86% compared with figures on defoliation of 23, 87, and 52%. Growth in 1952 was similar to that of 1950. Since the beginning of

the outbreak, 29% of the Aspen and 31% of the Birch have died. Mortality was closely related to attack by several species of borer, particularly *Agrilus* spp., and barkbeetles, which appeared to be encouraged by the weakened condition of the trees.

3040. HUSSON, R. *Ennomos quercinaria* HFN., géométride nuisible aux hêtraies. [***E. quercinaria*, a geometrid pest of Beech woods.**] *Rev. Path. vég.* 33 (1), 1954 (46–8). 6 refs. [F.] I.M.I.

Life history and habits [cf. *For. Abstr.* 17 (No. 629)] of this polyphagous species found on Beech, Alder, Oaks, Elms, Maples, Chestnuts and even Cherries.

3041. SCHNEIDER, G. Lohnt sich eine Bekämpfung des Buchenspinners? [**Is the control of *Dasychira pudibunda* economically justifiable?**] *Forst- u. Holzw.* 9 (18), 1954 (378–9). 1 ref. [G.]

Measurements of diameter increment in mature Beech that had suffered 90% defoliation in one or in two consecutive years indicated a mean reduction of 7 and 13% respectively in volume increment compared with a neighbouring healthy stand. The lowest cost of chemical control, estimated at DM.47/ha., would exceed the value of the increment loss through two defoliations. Three consecutive defoliations are rare.

3042. SERAFIMOVSKI, A. Ciklus razvića topolinog gubara u okolini Beograda. [**The developmental cycle of *Leucoma salicis* in the vicinity of Belgrade.**] *Zašt. Bilja* No. 25, 1954 (18–41). 15 refs. [Croat.e.] I.M.I.

A detailed account is given of all stages of the life history as observed in and near Belgrade. The most favoured hosts are *Populus* spp. and then *Salix* spp. *Meteorus versicolor*, *Exorista* spp. and *Apanteles solitarius* are important parasites of the larvae, and mass outbreaks are terminated by polyhedral virus disease. The tables and graph have English titles.

3043. KURIR, A. Die Frasspflanzen des Schwammspinners (*Lymantria dispar* L.). [**The food plants of *L. dispar*.**] *Z. angew. Ent.* 34 (4) 1953, (543–86). 273 refs. [G.g.] I.I.E.

Laboratory experiments were made with a large number of plants in order to find which were acceptable to larvae of *L. dispar*. The chemical constituents of the plants were considered, in order to discover whether there exist in the leaves of plants avoided by the larvae substances toxic or repellent to them. Observations are also presented on the colour of the frass. In all cases where the leaves contained a high % of latex, lactic acids, essential oils, glucosides, saponins, alkaloids, tannins and bitter principles, the larvae were repelled or killed.

3044. STANKEVIĆ, P. Hidrogenacija sirovog ekstrakta seksualnog mirisa ženke gubara. [**Hydrogenation of the crude extract of the sex [odour] attractant of female *Lymantria dispar*.**] *Šumarstvo* 8 (10/11), 1955 (616–24). 6 refs. [Serb.e.f.]

Describes experiments conducted in Serbia. When the crude extract obtained from the last two abdominal segments of unfertilized ♀s was hydrogenated it became much more attractive to ♂s. Methods of preparation and stabilization of the extract are described.

3045. BJEGOVIĆ, P. Avio-zamagljivanje gusenica gubara u Metohiji 1954 godine. [**Aerial mist spraying of *Lymantria dispar* larvae in the Metohija region [Serbian/Albanian border] in 1954.**] *Zašt. Bilja* No. 27, 1955 (65–77). 2 refs. [Croat.e.] I.M.I.

The operations described covered a total area of 6300 ha. of Oak thickets where *L. dispar* was very abundant and constituted a threat to orchards in the neighbourhood. Treatment was completed in the 9 days 30 May–7 June, when the larvae were mostly in the 2nd and 3rd instars. Almost all were done from a Junkers 34 aircraft making flights in the early morning and evening. A 33% DDT solution of Jugoslav manufacture was used at a mean rate of 2 kg./ha. Checks were made of droplet size [not specified], residual effect of the deposit (cut foliage tested on laboratory-reared larvae), and the reaction of the insects in the field just after treatment, along with later field checks which revealed no larvae of *L. dispar* in the areas one month after treatment. The operation is regarded as very successful. Some other insects that succumbed to the insecticide are mentioned [but without quantitative details].

3046. STEFANOV, D. Izsledvanija vărhu neobhodimostta ot săglasuvane na aviohimičnata borba sreštu găbotvorkata (*Lymantria dispar* L.) s bioekologičnite ì osobennosti. [**Investigations on the need for relating the aerial control of *L. dispar* to its bioecological characteristics.**] *Nauč. Trud. lesoteh. Fak. selskostopan. Akad., Sofia* No. 1, 1952 (97–108). 10 refs. [Bulg.bulg.russ.]

Results of control of *L. dispar* in Bulgaria in 1949, 1950, and 1951 are analysed: 100% larval mortality is obtained by dusting (5% DDT; 20 kg./ha.) at the first instar; after June 15 (5th instar or pupal stage) only ca. 30% are killed.

3047. ***Lymantria monacha* (L.) (Nun moth).** *Distr. Maps Insect Pests* (*Ser. A.*) No. 60, 1955. pp. [2]. [Commonwealth Institute of Entomology, London.]

Coleoptera

See also Nos. 2422, 2427–9, 2690, 2826–7, 2961–2, 3029, 3144.

3048. SCHWERDTFEGER, F. Buprestidae (Col.) an *Pinus*-Arten in Guatemala. (1. Beitrag zur Forstentomologie Mittelamerikas.) [**Buprestidae on *Pinus* spp. in Guatemala. (Contribution to the forest entomology of Central America—1.).**] *Z. angew. Ent.* 35 (2), 1953 (164–7). 6 refs. [G.] I.I.E.

Chalcophora spp., *Chrysobothris* sp., and *Agrilus schwerdtfegeri*.

3049. BECKER, G. Cerambyciden-Frassbild von bemerkenswerter Form. [**Unusual larval gallery design by Cerambycidae.**] *Z. angew. Ent.* 35 (2), 1953 (158–63). 6 refs. [G.] I.I.E.

Describes larval galleries of *Batocera wyliei* and *Lagochirus araneiformis*.

3050. CRAMER, H. H. Vorbeugender Schutz gegen den kleinen Pappelbock. [**Preventive spraying**

against *Saperda populnea*.] *Forst- u. Holzw* 10 (9), 1955 (179–80). 4 refs. [G.]

Of 4 Poplar plantations near Karlsruhe, 2 were sprayed with 4% active DDT at the beginning of the flight season on 16 June, 2 a fortnight later. A comparison of successful infestations with galls remaining from the flight year 1952 showed a marked reduction (to 11 and 15% respectively) on the early-sprayed plots, and a smaller (to 80 and 35%) on the others. On the early-sprayed plots, less than half the attempts at oviposition were successful. Untreated Aspen seedlings close by showed very heavy infestation.

3051. BRUSA, L., and CORSI, M. Lotta contro il *Cryptorrhynchus lapathi* L., parasita del pioppo, mediante irrorazioni di un insetticida a base di E.C.E. [**Control of *C. lapathi*, a pest of Poplar, by spraying with a BHC-base insecticide.**] *Ann. Sper. agr.* (*n.s.*) 10 (1), 1956 (109–17). [It.it.e.]

Spraying the trunks of trees in an infested plantation with a preparation (6% active ingredient), based on γ-BHC, effected good control by (1) preventing oviposition, (2) killing the existing adults. The residual effects of the spray lasted for 3–4 weeks.

3052. VERNALHA, M. M. *Heilipus parvulus*, praga da imbuia. [***H. parvulus*, a pest of Imbuia.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (263–6). [Port.e.]

An illustrated description of a curculionid found damaging seed of *Phoebe porosa* in Parana.

3053. PETERSEN, B. B. *Hylobius*-bekæmpelse: forsøg med DDT, parathion og blyarsenat. [**Control of *Hylobius* [*abietis*]: trials with DDT, parathion and Pb arsenate.**] *Dansk Skovforen. Tidsskr.* 40 (5), 1955 (200–15). 4 refs. [Dan.dan.e.]

In field experiments, spraying young Spruce with solutions containing 1% active DDT or 0·2% active parathion, or dipping the plants (top and roots, or top only) in DDT, gave good control. Spraying or dipping with Pb arsenate gave variable and relatively poor results. A study of an area [untreated] with natural regeneration after felling showed severe damage, more frequent on plants > 15 cm. high, but causing greater mortality among smaller plants. Plants from which half of the roots had been removed before planting were attacked to the same degree as sound ones, but the injury more often caused death. Results are shown in tables and graphs with English titles and legends.

3054. WARREN, G. L. **The effect of some site factors on the abundance of *Hypomolyx piceus* (Coleoptera: Curculionidae).** *Ecology* 37 (1), 1956 (132–9). 12 refs. [Forest Biology Laboratory, Winnipeg.]

[Cf. *For. Abstr.* 13 (No. 1386).] The larvae of *H. piceus* bore under the bark of the root systems of most conifers in the Northern forest zone. This boring causes resinosis, and larval damage may be traced by the resulting resin tubes. Most of the damage occurs at the root collar or in root crotches. In a method devised to assess the cumulative damage, individual roots and the root collar of each tree were rated separately, a maximum rating of five being arbitrarily assigned to each. The individual root damage was averaged for the tree and the average added to the root-collar damage, giving a maximum rating of ten for any tree. A damage index was established for each site by dividing the sum of individual tree ratings by the number of trees. Using this damage index, it was possible to compare relative population densities of *H. piceus* in different sites. The degree of insect damage was related to differences in the moisture content of sites. Natural indicators and humus analysis were used to divide sites into five broad moisture classes: very dry, dry, intermediate, wet, and very wet. Two methods of humus analysis, loss on ignition and moisture equivalent, proved to be excellent indicators of the suitability of sites to *H. piceus* attack. The site evaluation technique would require modification where obvious amounts of extraneous material, such as rotted logs, occur in any particular site or where ground-water levels have recently changed. Analysis of data showed that insect damage was more common on wet sites than dry ones. *From author's summary.*

3055. GRAHAM, S. A., and SATTERLUND, D. R. **White Pine weevil attacking Red Pine.** *J. For.* 54 (2), 1956 (133–4). [University of Michigan.]

Until very recently, the White Pine weevil (*Pissodes strobi*) had seldom been reported on Red Pine (*Pinus resinosa*) but of 1874 trees examined in 1955 in 17 plantations of *Pinus resinosa*, 2% of those growing in light shade and 12% of those in the open were attacked by *Pissodes strobi*. Contrary to existing information, the larvae completed their development in this host and at emergence rates comparable with those on more favoured hosts. Equal opportunities of feeding on White and Red Pine were offered to weevils newly emerged from these Pines, separately in glass jars, and the feeding punctures (> 5000) counted. Those bred on the Red still preferred the White Pine (puncture ratio 1/5·5) as did those bred on the White Pine. From this evidence it seems clear that the White Pine weevil in parts of Michigan has become adjusted to life on Red Pine, though when given a choice it still prefers to feed on White Pine. This preference, however, is not strong enough to prevent the beetles from feeding on both hosts.

3056. CONNOLA, D. P., MCINTYRE, T., and YOPS, C. J. **White Pine weevil control by aircraft spraying.** *J. For.* 53 (12), 1955 (889–91). 6 refs.

From data on aerial spraying of 5–10 ft. *Pinus strobus* with 2 lb. DDT/4 gal. kerosene/acre, it is concluded that *Pissodes strobi* can be so reduced as to require two or more years to build up damaging populations. A good 6 × 6 ft. stand is able to withstand 5–10% annual weeviling and still yield enough straight 16-ft. butt logs. Where weeviling is normally below and only occasionally rises above 10%, treatment is seldom necessary. On good sites in heavily infested areas, 1–2 sprayings per rotation may suffice. Costs were $2·50–4·00/acre.

3057. RHODES, A. D. **Comparison of lead arsenate, methoxychlor, and benzene hexachloride**

for the control of White Pine weevil [*Pissodes strobi*]. *J. For.* 54 (2), 1956 (134–5). [Forestry Department, University of Massachusetts.]

The second and third substances are probably at least as effective as arsenate for the hand spraying of terminal buds and leaders [cf. *For. Abstr.* 15 (No. 3818)], though BHC is objectionable to labour handling it. The forms used were Nusex (Pb arsenate); Hexone 10 GW (10% γ-BHC); Marlate 50 (methoxychlor 50% wettable powder); mixed respectively at 4, 1, and 2 lb./5 gal. water.

3058. POSTNER, M. *Strophosomus lateralis* (Coleoptera, Curculionidae) als Kiefernschädling. [***S. lateralis* as a pest of Pine.**] *Anz. Schädlingsk.* 29 (1), 1956 (10–1). 16 refs. [G.]

Damage to needles of 1-year-old *Pinus sylvestris* was found to be due to *Strophosomus lateralis*. Comparison of this infestation with one reported from Hanover 100 years ago show that in both cases *Calluna vulgaris* had been cleared from the site before the Pine was established. The resulting grass and herb cover had presumably offered favourable conditions for the development of the larvae, which then attacked the trees as an alternative to the *Calluna*.

3059. ZAŠEV, B. Merki za borba sreštu vărhovija korojad (*Ips acuminatus* Gyll.) pri uslovijata u nas. [**Control of *I. acuminatus* under Bulgarian conditions.**] *Nauč. Trud. lesoteh. Fak. selkostopan. Akad., Sofia* No. 1, 1952 (109–20). 12 refs. [Bulg. russ.]

Summarizes preventive and control measures recommended on the basis of the author's own investigations conducted in 1948 and 1951 in Bulgaria. Particularly stressed are: the use of logging waste as a trap; felling and burning of the bark of attacked trees; extensive use of trap trees; and chemical control measures, using DDT, BHC, diluted acetic acid, nicotine sulphate, creosote.

3060. CROOKE, M. ***Ips cembrae*: a first record [in the United Kingdom].** *FAO Plant Prot. Bull.* 4 (2), 1955 (30). I.M.I.

Notified first from the Monaughty Forest (Morayshire), this Larch barkbeetle has now been found, established as a breeding species, in 6 other localities in N.E. Scotland. It was probably imported in 1946 along with *Ips typographus* when large numbers of the latter arrived in consignments of German Spruce.

3061. DEFNE, M. *Ips sexdentatus* Boerner kabuk böceğinin çoruh ormanlarindaki durumu ve tevlit ettiği zararlar. [***I. sexdentatus* in the Çoruh forests and its ravages.**] *Istanbul Üniv. Orm. Fak. Derg.* 4*B* (2), 1954 (80–91). 12 refs. [Turk.]

An account of recent attacks, most serious on *Picea orientalis* but also on *Pinus nigra* and *P. sylvestris*, in this part of N.E. Turkey and of their causes. The extent of the infestation (area, volume and value of timber lost) is tabulated for the years 1949 to 1952 inclusive and control measures described.

3062. WICHMANN, H. E. Untersuchungen über *Ips typographus* L. und seine Umwelt. Die Ameisen. [***Ips typographus* and its environment. Ants.**] *Z. angew. Ent.* 35 (2), 1953 (201–6). 1 ref. [G.] I.I.E.

Notes the following species found in association with the beetles and their attacks (if any) upon them: *Formica rufa rufopratensis minor*, *F. cinerea*, *Lasius niger niger*, *L. fuliginosus* and *Myrmica laevinodis*.

3063. GÄBLER, H. Dipterenlarven als Parasiten und Synöken des Buchdruckers, *Ips typographus* L. [**Dipterous larvae parasitic on or commensal with *I. typographus*.**] *Z. angew. Ent.* 35 (1), 1953 (55–62). 12 refs. [G.] I.I.E.

Short notes on *Medetera* sp., *Lonchaea* sp., a cecidomyid, a stratiomyid, *Lycoria* sp., *Forcipomyia* sp. and an unidentified species.

3064. SCHWERDTFEGER, F. Pathogenese der Borkenkäfer-Epidemie 1946–1950 in Nordwestdeutschland. [**Pathogenesis of the 1946–50 barkbeetle epidemic in Northwest Germany.**] *SchrReihe forstl. Fak. Univ. Göttingen* No. 13/14, 1955. pp. 135. 81 refs. [G.g.]

Gives data on the extent and development of the epidemic in Lower Saxony, Nordrhein-Westfalen and Schleswig-Holstein, using as a regional index chiefly the ratio of beetle-damaged timber cut per year to the normal annual cut. The outbreak appears in general to have been most severe in regions immediately adjoining the natural habitat of Spruce. War and wind damage, aggravated by overcutting (leaving stands too open and too exposed), lack of labour, and abnormal weather are cited as main causes. The influence of the degree of occurrence of Spruce in an area, of environmental factors, age, density and quality of stands, mixtures and fungus diseases, and of control measures are discussed, also the susceptibility of the individual tree in terms of attraction (e.g. through special smell), moisture content, osmotic pressures, and peeling resistance of the bark and phloem of sound and infested, standing or felled trees, and of resin flow as the chief defence mechanism. A final chapter describes the pathological symptoms of infested trees, boreholes, needle shedding and discoloration, and loss and discoloration of bark, and briefly discusses physiological and other causes (e.g. woodpeckers). All chapters are separately summarized and are largely based on German literature.

3065. KRAEMER, G. D. Die kritischen Grenzen der Brutbaumdisposition für Borkenkäferbefall an Fichte (*Picea excelsa* L.). Untersuchungen zur Ökologie von *Ips typographus* L., *Pityogenes chalcographus* L., *Polygraphus poligraphus* L. und *Dendroctonus micans* Kug. [**The critical limits of the predisposition of Spruce (*Picea abies*) to attack by barkbeetles. The ecology of *Ips typographus*, *Pityogenes chalcographus*, *Polygraphus poligraphus* and *Dendroctonus micans*.**] *Z. angew. Ent.* 34 (4), 1953 (463–512). 51 refs. [G.g.] I.I.E.

A continuation of studies already carried out on Fir [cf. *For. Abstr.* 12 (No. 2410)]. Physiological and ecological factors predisposing Spruce to barkbeetle attack are described. Critical osmotic pressures in the bark, rendering the tree susceptible to attack, are 6·5–7 atm. for *Ips typographus*, 7·5–8 atm. for *Pityogenes chalcographus* and ca. 6 atm. for

Polygraphus poligraphus. For *Dendroctonus micans* no particular weakening of the tree predisposing it to attack could be found. The attraction of weakened trees to beetles appears to be attributable to a chemical stimulation and a consequent evaporation of cell sap brought about by the fall in osmotic pressure.

3066. GØHRN, V., HENRIKSEN, H. A., and PETERSEN, B. B. Iagttagelser over *Hylesinus* (*Dendroctonus*) *micans*. [**Observations on *D. micans*.**] *Forstl. Forsøgsv. Danm.* 21 (4), 1954 (382–433). 33 refs. [Dan.dan.e.]

Observations were made in 1949–53 in plantations at Nystrup and, to a smaller extent, in 3 other districts. The number of larval instars was determined, from measurements on the head capsules of 2535 larvae selected at random, as five. In Denmark the life cycle is generally of 2, sometimes of 3, years. Oviposition begins about 1 June and continues until autumn. Pupation takes place in June–September. Hibernating groups are 2nd- and 3rd-instar larvae, and 5th-instar larvae and imagos. It is doubtful whether overwintering eggs develop. These observations are compared with those from earlier literature, much of it German. *Rhizophagus grandis*, *R. dispar*, *Ephialtes terebrans* and an unidentified fly are the main enemies. Observations at Nystrup, in stands 40–47 years old, showed that attacks developed most rapidly in the most heavily thinned areas. There was a slight tendency to increasing attack with increasing tree diameter. The smaller trees were attacked mainly on the lower 2 m. of the stem. A detailed examination of 19 trees showed that attack took place as high as 17–18 m. above the ground and that the first attack might be as high as 8–9 m. In an examination to determine how far *Fomes annosus* might have been responsible for mortality, 70% of 47 stumps examined showed no trace of the fungus, 22% showed discoloration insufficient to have caused death and 8% showed rot sufficient to have caused death. Both at Nystrup and in the 20-year-old stands at Vilsbøl, *F. annosus* was present, but there appeared to be no relationship between the attacks by the insect and the fungus. Laboratory experiments on control suggested that Pb arsenate might give satisfactory results in the field; DDT and dieldrin were effective only in very high concentrations (15 and 25% respectively). Field experiments with Pb arsenate have not so far been effective.

3067. CALLAHAM, R. Z. **Sapwood moisture associated with galleries of *Dendroctonus valens*.** *J. For.* 53 (12), 1955 (916–7). 2 refs.

An examination of the distribution of sapwood moisture about the gallery areas of this insect and a discussion of its physiological effects in *Pinus jeffreyi* (resin flow and disease resistance).

3068. SHIFRINE, M., and PHAFF, H. J. **The association of yeasts with certain bark beetles.** *Mycologia* 48 (1), 1956 (41–55). 20 refs. P.R.

Saccharomyces pini, *Hansenula capsulata*, *Pichia haplophila*, *Candida silvicola*, *C. curvata*, *C. parapsilosis*, *C. mycoderma*, *C. rugosa*, *Torulopsis nitratophila*, *T. melibiosum*, *Rhodotorula crocea*, *Cryptococcus diffluens* and *C. neoformans* were isolated from *Dendroctonus brevicomis*, *D. monticolae*, *D. jeffreyi*, *D. valens*, *Ips oregoni*, *I. confusus* and *I. emarginatus* found on *Pinus ponderosa*, *P. jeffreyi*, *P. monticola*, *P. contorta* var. *latifolia* and *P. lambertiana*, all growing in Carolina.

3069. RUMMUKAINEN, U. Über das Auftreten des grossen Birkensplintkäfers, *Scolytus ratzeburgi* Jans., in den Schneeschadengebieten des Winters 1947–48 in Nord-Karelien. [**The outbreak of *S. ratzeburgi* [on Birch] in the areas of N. Karelia damaged by snow in the winter of 1947–8.**] *Commun. Inst. for. Fenn.* 44 (3), 1954 (1955). pp. 41. 38 refs. [G.g.fi.]

The investigation confirmed the same author's previous findings, that this insect attacks almost exclusively fallen trees and prefers rough- to smooth-stemmed trees [cf. *For. Abstr.* 16 (No. 721). Data on its life history are given.

3070. RICHTER, G. Untersuchungen über die Stabilität von Hexa-Präparaten in verschiedenen Böden im Hinblick auf die Engerlingsbekämpfung. [**The stability of BHC preparations in different soils in connexion with cockchafer control.**] *NachrBl. dtsch. PflSchDienst.* 10 (1), 1956 (7–13). 16 refs. [G.g.]

Sandy and clay soils treated with BHC did not lose their toxicity after being subjected to normal cultivation methods. Soils taken from Pine stands treated 4 years previously were still highly toxic to cockchafer larvae.

3071. STEFANOV, D., and ZAŠEV, B. Izpolzuvane na heksahlorana i DDT za borba sreštu larvite na junskija i maĭskija brămbar (*Amphimallon solstitialis* i *Melolontha melolontha* L.) v gorskite razsadnici. [**Application of BHC and DDT in the control of *A. solstitialis* and *M. melolontha* in forest nurseries.**] *Nauč. Trud. lesoteh. Fak. selskostopan. Akad., Sofia* No. 1, 1952 (83–96). 9 refs. [Bulg. bulg.russ.]

Tests with BHC (12% dust, from 5 to 20 g./sq.m.), and DDT (5% dust, 10 or 20 g./sq. m.) mixed with the soil to a depth of 10 cm., on seedlings of *Pinus nigra* (also *Picea abies*, *Quercus* spp., and *Robinia pseudoacacia*) gave the following results: (1) BHC with *P. nigra* reduced the incidence of pests to $\frac{1}{33}$, DDT only to $\frac{1}{3}$; BHC, moreover, had a stimulating effect on the seedlings; (2) with *P. abies* BHC appeared to cause damage to the seedlings, whereas DDT halved the incidence of pests; (3) with *Quercus* and *R. pseudoacacia*, no unfavourable effects of BHC or DDT were observed, but no data were obtained regarding their efficacy as insecticides. BHC should be used at 5–8 g./sq. m. for protecting seedlings of *P. nigra*; DDT at 8–10 g./sq. m. for *P. abies*.

3072. RUDNEV, D. F., and PAŠOV, N. F. Itogi vnedrenija v Ukrainskoĭ SSR metoda zaščity korneĭ sejancev sosny dustami DDT i GHCG pri oblesenii ploščadeĭ, zaražennyh ličinkami hruščeĭ. [**Results of the introduction in the Ukraine of the method of protecting Pine seedling roots with DDT and BHC dusts during the afforestation of areas infested by cockchafer grubs.**]

Sbornik Ukrainskogo Resp[ublikanskogo] Otdelenija Vsesojuznogo Inženernotehničeskogo Obščestva Lesnoï Promyšlennosti i Lesnogo Hozjaïstva 1954 (1/2), (94–106). From *abstr.* in *Referat. Ž.* (*Him.*) 1955 (10), (No. 19257). [Russ.] P.O.

Recommends dusting the roots with DDT and BHC before planting. As BHC can damage the plants on dry soils it should be introduced some distance away from the roots.

Hymenoptera

See also No. 2699.

3073. JACKSON, D. S. **The *Pinus radiata*/*Sirex noctilio* relationship at Rotoehu Forest.** *N.Z. J. For.* 7 (2), 1955 (26–41). 4 refs.

An outline is given of stand development and mortality in *Pinus radiata* at Rotoehu Forest, and factors possibly conducive to the heavy mortality are discussed. It is indicated that there is no simple primary cause, but than inter-relationship of natural competitive effects with a superimposed and dependent population of *Sirex noctilio* forms the underlying mechanism. The following hypothetical pattern for this mechanism is given. Competition and suppression in even-aged *P. radiata* planted in Rotoehu Forest at 6 × 6 ft. commence at ca. 4–5 years, becoming acute by the 6th, 7th and 8th years. *S. noctilio* gains a foothold in the plantation during about the 5th year, stems being too small to carry larvae before this age. It establishes itself in the weakened subordinate element of the stand during the 6th and 7th years when maximum numerical losses of trees occur. *Sirex* populations attain their peak levels between the 6th and 9th years, depending on oscillations in the proportion of the sexes, advantageous weather etc. During the crucial 8th and 9th years, however, the *Sirex* hordes, though preferring to attack suppressed trees, are forced through lack of these to attack a higher % of healthy dominant trees than have been attacked previously. Thereafter the *Sirex* population, as it meets more vigorous resistance, begins to decline from its peak level. From about the 14th year onwards, a residual population maintains itself in the few weaker trees that drop behind each year, occasionally flaring up to take a few dominants. The best time for thinning would seem to be at 7 years, after the most susceptible trees have been killed by *Sirex*. The object would be to remove all weak, subordinate trees (not recognizable earlier) so as to hit the *Sirex* population before it could divert its depredations to the valuable dominants of good form.

3074. RÖHRIG, E. **Die Lärchengespinstblattwespe *Cephaleia alpina* Klug: Untersuchungen bei einer Massenvermehrung in Schleswig-Holstein. [*C. alpina*: investigations made during an outbreak in Schleswig-Holstein.]** *Z. angew. Ent.* 35 (2), 1953 (207–45). 21 refs. [G.] I.I.E.

Geographical distribution, taxonomy, morphology, life history, and ecology, with notes on an outbreak in Schleswig-Holstein in 1948–49.

3075. NITTO, M., ODA, K., and KATO, Y. **[On the life-history of the Spruce sawfly (Pamphiliidae) and the means of their control at Oneyama in Gumma Prefecture, Central Honshu.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 79, 1955 (15–42). 24 refs. [Jap.jap.e.]

Descriptive notes and drawings are given of the egg, larva, pupa and imago of *Cephaleia isshikii*. Adults emerge from the soil in June and oviposit on young needles of *Picea* (5 species, including *P. abies*). The larvae, which hatch in 10 days, build webbed nests, feeding until late July. They then hibernate as 5th and 6th instars in the soil and pupate there for a fortnight from mid-May. Parasites include *Bacillus sotto* and *Isaria* spp. (Tachinidae), the former being the more important. Larval resistance to DDT sprays increases at the 4th instar.

3076. THALENHORST, W. Vergleichende Betrachtungen über den Massenwechsel der Kiefernbuschhornblattwespen. **[Fluctuations in populations of Pine sawflies.]** *Z. angew. Ent.* 35 (2), 1953 (168–82). 23 refs. [G.g.] I.I.E.

Discusses, on the basis of world literature, factors affecting outbreaks, and attempts to distinguish certain specific and environmental factors affecting the rise and fall of populations.

3077. ELTON, E. T. G., BLANKWAARDT, H. F. H., and ALTENA, A. C. VAN. Plagen van *Diprion pini* L. in Nederland in 1950 en 1951. **[Outbreaks of *D. pini* in the Netherlands in 1950–51.]** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 19, 1955. pp. 15. 13 refs. [Du.e.] (*Repr.* from *Ned. Boschb.-Tijdschr.* 27 (7), 1955 (162–76).)

The infestations started independently in a number of places. Damage increased during 1950 and reached a peak with the second generation of 1951, but most of the larvae of this generation were destroyed by an infectious disease and the population had returned to normal by 1952. The final suppression of the outbreak may be attributed to this disease or to the egg parasite *Achrysocharella ruforum* which had become very abundant. Some outbreaks could only have originated in planted stock and none were observed to have originated, as in 1938–41, among scattered wild Scots Pine, spreading later into plantations. A method of predicting damage on the basis of the number of newly emerged larval colonies per tree on a number of sample trees was reasonably quick and cheap, and indicated whether control measures were required. Further work on the value of this method is needed.

3078. VASIĆ, K., and SISOJEVIĆ, P.; STEFFAN, J. R. Paraziti obične borove zolje (*Diprion pini* L.) i njihova uloga u regulaciji brojnosti ove štetačine na Maljenu 1951–1952 godine. **[Parasites of *D. pini* and their part in the regulation of the numbers of this pest on Mt. Maljen in 1951–52. With an appendix by J. R. Steffan redescribing *Monodontomerus strobili*.]** *Zašt. Bilja* No. 27, 1955 (3–43 + 6 plates). 10 refs. [Croat.f.] I.M.I.

Gives a complete list of the parasites reared from cocoons and eggs of *D. pini* during this outbreak [cf. *For. Abstr.* 17 (No. 656)], with information on their life history and ecology. Fifteen species of Hymenoptera (13 parasites and 2 hyperparasites)

and two Tachinidae were involved. Of 14,759 first-generation cocoons collected, 45·6% were parasitized or had been destroyed by other agencies. The high second-generation population is attributed to the high % of unparasitized cocoons, the favourable sex ratio (ca. 1 ♂ : 2 ♀) and high fertility. In one of the 5 localities studied, the second generation was much reduced by the egg parasite *Achrysocharella ruforum*, and in two others, by chemical control measures. Of the 879 second-generation cocoons collected, only 20·7% produced adults of *D. pini*, 37·43% being parasitized, 28·66% killed by other agencies, and 13·2% in diapause. The highest parasitization %s occurred in material from the two original foci of infestation. Ichneumonids were the most important group of parasites. Mice and parasitic fungi also helped to reduce populations.

3079. PETERSON, L. O. T. **Retarding Larch sawfly damage in Larch plantations.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 11 (6), 1955 (2).

Aerial spraying was tested on Larch plantations infested with *Pristiphora erichsonii*, which had grown too tall for the usual ground spraying. A Piper Cub aircraft was used and the spray mixture was 6 gal. malathion 50% emulsible concentrate in 15 gal. water. The rate of defoliation appears to have been slowed down and serious stripping occurred only on a few trees.

3080. KIRKLAND, R. C., and STYLES, J. H. **Notes on *Pristiphora glauca* Benson.** *Bull. ent. Res.* 46 (4), 1956 (749–52). 1 ref.

The activity of *P. glauca*, apparently one of the least widespread of Larch sawflies, appears to be confined to spring and early summer. The life cycle, larval descriptions, field characteristics, distribution and difference in feeding as compared with *P. wesmaeli*, are dealt with. [Cf. *For. Abstr.* 16 (No. 3233).]

3081. VITÉ, J. P. Zum Massenauftreten der Lärchenblattwespe. **[On epidemics of *Pristiphora wesmaeli*.]** *Forst- u. Holzw.* 10 (18), 1955 (374–5). [G.]

A preliminary account of research done at the Institute of Forest Zoology, Göttingen University, on the occurrence, bionomics, damage and control of the pest, which had recently caused complete defoliation of young long-shoots in Larch plantations on dry and warm sites, in Schleswig-Holstein and Hesse. While 4- to 7-year trees suffered most, 2-year-old transplants and 20- to 30-year-old stands were also attacked, and it is expected that the epidemic will spread. Defoliation checked growth, particularly on poorer sites and where other pests had attacked secondary shoots earlier in the year. Only where such retardation would affect the Larches' positions in mixed stands, should control measures (parathion-type preparations or other long-lasting contact insecticides) be applied, preferably in early summer.

Diptera

3082. INOU(Y)E, M. **[A new gall midge (Itonididae) which attacks the bark of Sugi (Japanese Cedar).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (1–15). [Jap.jap.e.]

A detailed illustrated account and description with biometrical tables of *Thomasiniana odai*, the larvae of which tunnel in the subcortical layers and cambium of *Cryptomeria japonica*. Should the tree survive, it is weakened and courts are provided for fungal and bacterial rots. The damage to the timber and tree is illustrated.

459. Other Animals

See Nos. 2735–6.

46. Damage to Tree Growth by Man

See also Nos. 2642, 2946.

3083. GOOR, C. P. VAN. Over de toelaatbaarheid van moswinning in grovedennenbossen. **[The permissibility of moss-gathering in Pine woods.]** *Tijdschrift der Nederlandsche Heidemaatschappij, Arnhem* 64 (10), 1953 (277–81). [Du.] H.S.B.

Samples from the loads of moss-gatherers in N. Brabant showed that material was being removed at an annual rate of 106,000 kg. fresh, or 40,700 kg. dry weight per ha. About ¼ of this was moss, the remainder was humus and litter. An analysis of the moss showed that its content of organic material, P_2O_5, K_2O, CaO and MgO was higher and of N slightly lower than that of litter and humus. Arguments that moss should be removed because (1) it intercepts and retains rainwater, (2) it does not break down readily, and (3) it is a symptom of unhealthy conditions in the stand, are discussed briefly and refuted. It is concluded that moss removal should be tolerated only if it is replaced by 40–60 tons/ha. of compost.

48. Injuries Due to Unknown or Complex Causes

3084. MURRAY, J. S. ***Rhizina inflata* associated with group dying of conifers in Britain.** *FAO Plant Prot. Bull.* 4 (1), 1955 (6). [Forestry Research Station, Farnham, Surrey.]

Group dying was first noted in Sitka and later in Norway Spruce. Recently it has occurred in pure Larch and on individual Scots, Corsican and Lodgepole Pines included in dying groups of Sitka. The groups cease to extend after some years. The main areas affected are West Britain and Ireland. A survey has shown a general association with the meal-time fires lit by workmen. The usually saprophytic *Rhizina* fruits vigorously on the charcoal, and fruit bodies are common on the ground in the groups [cf. *For. Abstr.* 15 (No. 2717)]. The majority of cases have also followed the first thinning, when such fires are lit. Mycelia have been traced to the dark necrotic spots revealed in the cortical tissues of dead tree-roots by rubbing off the bark. The gradual death of the roots is followed by a thinning of foliage and a slowing down of increment. Experiments are in progress to test the effects of fungus and of fires in promoting these symptoms. [Cf. *For. Abstr.* 15 (Nos. 3855–6).]

3085. MCKAY, R., and CLEAR, T. **A further note on group dying of Sitka Spruce and *Rhizina***

***inflata*. *Irish For.* 12 (2), 1955 (58–63). 2 refs.**
Includes photographs of fructifications of *R. inflata*, enlarged lenticels and copious resin flow on the stem of a dying tree, and a typical example of group dying. [Cf. *For. Abstr.* 15 (No. 3856).]

3086. FERRELL, W. K. **The relationship of pole blight of Western White Pine to edaphic and other site factors.** *Res. Note For. Exp. Sta. Idaho* No. 13, 1955. pp. 7. 8 refs.
A study of soil and site factors in healthy and diseased stands of *Pinus monticola* inside and outside the pole-blight area, showed no close correlation with the disease, which occurred on every type of soil and site.

3087. LEAPHART, C. D. **Physiological studies of some fungi associated with pole blight of Western White Pine.** *Mycologia* 48 (1), 1956 (25–40). 15 refs. P.R.
Temperature, pH and vitamin requirements, and carbohydrate and N utilization were determined for 4 isolates of *Leptographium* sp. and 1 isolate of *Ceratocystis pilifera*, isolated from different *Pinus monticola* trees.

3088. GODMAN, R. M. **Progress of top-dying in Yellow Birch—Upper Michigan, 1954–55.** *Tech. Note Lake St. For. Exp. Sta.* No. 444, 1956. pp. 2.
Observation plots, established in 1954 and examined in 1955, showed that top-dying in slightly injured and apparently healthy trees had developed rapidly during the year, while more severely damaged trees had tended to remain in the same injury class. Some trees (especially the smaller ones) in nearly all classes showed a trend towards recovery. Cut-over stands seemed to be more affected than virgin stands. Permanent-sample-plot records show that dieback on individual trees in the past has occurred without appreciable reduction in growth over 5-year periods. Results are tabulated.

3089. STOVER, W. S., and TOOLE, E. R. **Sweetgum blight in Louisiana as determined by the forest survey.** *Plant Dis. Reptr.* 39 (11), 1955 (864–6). A.P.B.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also No. 3546.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

See also No. 3003.

3090. HAMPF, F. E. **Relationship of stump diameter to d.b.h. for Yellow-Poplar in the Northeast.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 55, 1955. pp. 3. 2 refs.
Presents, on the basis of 939 measurements, a graph from the equation: d.b.h. = 0·896 (stump diam. u.b.) + 1·406 (stump height) − 0·575.

3091. PARDÉ, J. Un appareil révolutionnaire: le Rélascope à miroir de Bitterlich. [**A revolutionary instrument: Bitterlich's Mirror Relascope.**] *Rev. for. franç.* 8 (3), 1956 (172–84 + 4 photos + 1 drawing.) 15 refs. [F.]
A detailed description of the improved instrument and its use [cf. *For. Abstr.* 17 (No. 1828)].

3092. VINEY, R. Les objections à la méthode de Bitterlich. [**The disadvantages of Bitterlich's method.**] *Rev. for. franç.* 8 (3), 1956 (185–8). [F.]
Briefly enumerates objections commonly made on the score of (1) possible errors, (2) relative unimportance of mean basal area as a mensurational category, and (3) unsatisfactoriness of sampling methods as such, and indicates how they can be met.

3093. HANRAS, J. Étude sur l'application de la méthode de Bitterlich aux forêts de pins maritimes. [**A study on the application of Bitterlich's method to *Pinus pinaster* stands.**] *Rev. for. franç.* 8 (3), 1956 (161–71). [F.]
An account of the '*Winkelzahl*' method of estimating mean basal area by means of the Relascope, and its application to *P. pinaster* stands in the Landes. The combined use of data thus obtained with data on '*temps de passage*' obtained from increment cores, is discussed briefly.

3094. SENDA, M., and MAEZAWA, K. **On the measurement of stand basal area by the Bitterlich method.** *Transl. Fac. For. Univ. B.C.* No. 14, 1955. pp. 11. 9 refs. Transl. by K. Maezawa from *Misc. Inform. Tokyo Univ. For.* No. 10, 1955 (69–76). [See *For. Abstr.* 16 (No. 4372).]

523. Bark

See also Nos. 3209, 3357.

3095. MCCORMACK, J. F. **An allowance for bark increment in computing tree diameter growth for Southeastern species.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 60, 1955. pp. 6.
On the basis of extensive sample measurements, average values for diameter o.b. and u.b. were plotted for 2-in. diameter classes, disclosing a linear relationship. Regression coefficients or 'growth factors' for the computation of total diameter increase from increment cores are given for 55 Southeastern species. [Cf. Meyer (1943), *For. Abstr.* 5 (p. 144).]

3096. HUTCHINSON, I. D. **A note on bark thickness in Radiata Pine.** *N.Z. J. For.* 7 (2), 1955 (86–7).
Gives a table of bark thickness in inches for log diameters (u.b.) of 7 to 36 in.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 3099–3103.

3097. MÜLLER, G. Inhaltsberechnungen von Stämmen und sonstigen Rotationskörpern mit Hilfe der Flächenformzahlen ihrer Vertikalprofile. **[Calculation of the volume of stems and other solids of rotation from the area form factor of their vertical profiles.]** *Arch. Forstw.* 3 (7/8), 1954 (717–23). 3 refs. [G.g.]

Basing calculations initially (despite objections) on the general equation for the stem conoid, $y^2 = px^r$ where r is the form exponent, the volume is $\frac{\pi y^2 x}{r+1}$. That of the cylinder is $\pi y^2 x$, which gives (by division) the general (solid) form factor, f, as $\frac{1}{r+1}$. The area, F, of the vertical profile exposed by a longitudinal section along the axis is shown to be $\frac{2xy}{r+2}$. That of the rectangle is xy, giving (by division) an area form factor, f' of $\frac{2}{r+2}$. The following are also derived: $r = \frac{2}{f'} - 2$, or $\frac{1}{f} - 1$; $f = \frac{f'}{2-f'}$; and

$$\text{volume} = \frac{d^2\pi h}{4}\left(\frac{f'}{2-f'}\right) = \frac{d\pi}{4} \cdot \frac{F}{(2-f')}.$$

By planimetering the area of the profile shown in a graphical stem analysis, f' is immediately derived, and through it, f and the volume of the stem (adjusting by simple multiplication if the height and diameter scales are different). A table gives the values for r, f and f' for the cylinder, cubic and common paraboloids, cone and neiloid; the validity of the derived volume equation is then discussed, and found good for each of these forms. It exaggerates the contents of the sphere and spheroid, however, by 3%. The formula is claimed as an adequate approximation for the irregular form common in tree stems and as a definite simplification in pure mathematics for the determination of the volumes of solids of rotation. The possible application of the formula in determining the volumes of standing trees by photographs is also suggested.

524.3. Volume of Tree Groups and Stands

See also Nos. 3107–9, 3143.

3098. PARDÉ, J. Les tarifs de cubage récents. **[Recent volume tables.]** *Rev. for. franç.* 8 (2), 1956 (108–14). 6 refs. [F.]

Discusses the methods of construction of recent Italian, Swiss, British, German, and Dutch volume tables.

3099. KRÄUTER, G. Das Waldhöhentarif-System. **[The 'forest height tariff'].** *Arch. Forstw.* 4 (2/3), 1955 (226–31). [G.] [Institut für Forstwissenschaften, Eberswalde.]

The significance of existing 'tariff' methods for enumerations, and proposals and bases for a new one suitable for volume and increment determination and yield-class construction are discussed. In order to compare the construction of existing tariffs, the form-height curves of their middle classes were calculated and set out together. These form-height curves cover 14 diameter classes and the system forms the height tariff of the method proposed. To measure an actual stand, height and diameter are taken on 2 stems in each of the top 4 diameter classes. The 'mean tariff' of a species is obtained from these 8 measurements and is fitted as a result of the special arrangement of the height measurements to the 'mean height' of the stand so that sufficient accuracy in volume determination is obtained. This use of height distinguishes the tariff from all others. The method consists in using this height tariff and separate volume tariffs for broad-leaved species together, and for conifers (Birch following the conifer tariff less 10%). These tariffs give single-stem and per-hectare volumes. This grouping of species for volume calculation whilst fixing the height tariff by species is a great simplification in volume calculation. Tested on a growing stock of 115,000 cu.m. against sampling methods at compartment level and against the complete enumeration of stands of species (Pine, Beech, Spruce, mixed Oak and Douglas Fir) the error lay between 0 and 5%. The height-tariff curves are illustrated. By drawing across them lines representing age, and curves representing quality classes, site-index information can be presented, the example given being drawn from Wiedemann's Scots Pine Table, 1943. For determining volume increment, the mean tariff of the stand, and the stand table (number of stems in each diameter class), both available from the volume calculations, and the diameter increment (from borings) are required. A comparison carried out in 100 stands, of this method with that of Prodan [cf. *For. Abstr.* 13 (No. 1414)] gave a figure less than his by 3·15%.

3100. MILOJKOVIĆ, D. T. Istraživanje oblika i zapremine jele u zaštićenim šumama Planine Tare. **[Studies on the form [quotient] and volume of Silver Fir in the selection forests of Mt. Tara [, W. Serbia].]** *Zaštita Prirode, Beograd* No. 4/5, 1953 (251–312). 35 refs. [Serb.g.f.]

The data given are based on measurement of 611 felled trees from mixed Beech/Fir in stages of transition from virgin to selection forest. The section on form includes discussion of the influence of stand constitution, composition and age, and a stem volume table is appended for d.b.h. of 10–60 cm. and heights of 6–34 m. The French summary gives translated legends of the tables and graphs.

3101. DUHOVNIKOV, JU. Sbegova tablica za celi dărvostoi i neĭnoto praktičesko izpolzuvane pri sortimentiraneto im. **[Taper table for entire stands and its use in their grading.]** *Nauč. Trud. lesoteh. Fak. selskostopan. Akad., Sofia* No. 1, 1952 (61–72). 5 refs. [Bulg.bulg. russ.]

A combined taper and volume table for a Lime coppice stand (mean height 16 m., d.b.h. 6–34 cm.,

mean d.b.h. 18 cm.) is derived from two fundamental curves: (1) of taper, expressed as diameter gradient for mean stems of each diameter class, and (2) of the volume of sections 1, 2, 3 . . . m. long for each diameter class, expressed in % of the total stand volume. Different uses of tables of this kind are discussed.

3102. Duhovnikov, Ju., and Iliev, A. Obemni tablici i tablici za pălnodărvesnostta na jasena. [**Volume tables and taper tables for Ash [*Fraxinus excelsior?*].**] *Nauč. Trud. lesoteh. Fak. selsko-stopan. Akad., Sofia* No. 1, 1952 (73–82). 3 refs. [Bulg.bulg. russ.]

Based on 25 sample trees from the Longoza forest, Bulgaria, and intended chiefly for local application.

3103. Plavšić, M. Tabele drvnih masa za poljski jasen (*Fraxinus angustifolia* Vahl). [**Stem volume tables for *F. angustifolia*.**] *Šum. List* 78 (11/12), 1954 (550–61). 19 refs. [Croat.g.]

F. angustifolia is one of the economically important species in the lowland forests along the rivers Sava, Drava and Danube. Since the existing volume tables are only local [cf. *For. Abstr.* 15 (No. 541)], based either on one criterion [d.b.h.?], or d.b.h. and total height, the author constructed new tables using the criteria of d.b.h. and site class (based on height). The material was collected from the Posavske (Sava river) University forests at Lipovljani, alt. 96 m. Ten stands on site class 1, two on class 2, and one on class 3 were examined. Tree-height and form-height curves were plotted over d.b.h. for the 3 site classes, and volume tables were then prepared on the basis of these curves and Emrović's local volume tables. For 158 felled and measured stems, aged 10–70 years, the new tables gave a total volume error of + 2·2%, as compared with − 0·95% for Emrović's tables, but their use involves less measuring work.

3104. Fechner, G. H. **A cubic-foot volume table for Ponderosa Pine in the northern Black Hills [S. Dakota and Wyoming].** *Res. Note Colo. Sch. For. Range Mgmt.* No. 2, 1956. pp. 2.

Based on 177 felled trees between 4 and 19 in. d.b.h., combined in a single site class.

524.4. Recording of Data. Organization of Measuring Parties and their Work

3105. Knox, R. L. **Forest inventory for management of state lands in Minnesota.** *J. For.* 54 (2), 1956 (123–9).

Details the procedure, data recorded and costs for a punched-card tabulation of working-plan data on a state-wide basis. Forest types (outlined over aerial photos and checked on the ground) are the basis of the 1% systematic sampling done in $\frac{1}{5}$- or $\frac{1}{10}$-acre circular plots on traverses laid down to sample the types. The information is recorded on combined tally/punch sheets and transferred to cards (facsimiles shown). Simplicity, cheapness, and immediate availability of comprehensive management data are claimed.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 3105, 3548.

3106. Stevan, B. Točnost određivanja drvnih masa sastojina polaganjem primjernih pruga. [**The accuracy of stocktaking by the sample strip method.**] *Šum. List* 79 (7/8), 1955 (221–30). 6 refs. [Croat.e.]

Analyses statistical results obtained by determining the stand volume of 3 stands by means of sample strips ca. 10 m. wide laid out at 100-m. intervals, as compared with figures obtained by calipering all the trees in the stand. The accuracy of the sample-strip method was determined by the method of least squares, the b.a. being considered the main factor. It was found that, while a total strip area of < 5% might often yield serviceable results, it is advisable to use a total strip area of 5–10%.

525. Volume by Assortments. Merchantable Volume

3107. Young, H. E. **Local pulpwood volume tables.** *Tech. Note Univ. Me. For. Dep.* No. 37, 1955. pp. 5.

Gives 4 local tables prepared by a method previously described [cf. *For. Abstr.* 17 (No. 1843)].

3108. Carl, C. M., Mawson, J. C., and Young, H. E. **White Pine topwood volume tables.** *Tech. Note Univ. Me. For. Dep.* No. 36, 1955. pp. 4.

Provides tables giving (1) cubic volume, (2) volume in cords (*a*) barked, (*b*) unbarked, for pulpwood (4–8 in. diam.) obtainable from *Pinus strobus* below the diameter limit for sawlogs.

3109. Mawson, J. C., and Young, H. E. **Topwood volume tables: second-growth Hemlock, old-growth Hemlock, and Red Spruce.** *Tech. Note Univ. Me. For. Dep.* No. 39, 1956. pp. 4.

Volume is given in number of 4-ft. bolts for *Tsuga canadensis* and *Picea rubens*.

3110. Salo, E. Puuston teknillinen vikaisuus ja sen vaikutus puustosta saatavien eri puutavaralajien määrään. [**The effect of technical defects on the amount of timber.**] *Metsät. Aikak.* 1955 (12), (412–4). [Fi.e.] (*Metsätietoa, Helsinki* No. 2, 1955.)

An investigation on circular sample plots in different parts of S. Finland showed that defects (e.g. crook, canker) decreased the amount of sawlogs obtained by 28·5% for Birch, 2·57% for Spruce and 1·12% for Pine. In Spruce pulpwood the reduction was 2·44% and in Pine pulpwood 0·2%. [Cf. *For. Abstr.* 16 (No. 3291).] *From author's summary.*

526. Log Measurement. Scaling

3111. Bäcklund, O., and Hamilton, H. Enmansmätning med hålkort vid stubben. [**Log measurement at stump by one man using punched cards.**] *Skogen* 43 (3), 1956 (49–50). [Sw.]

Discusses the advantages, especially for rapid calculation of loggers' earnings, when one man equipped with cards in a special container, slung

from his shoulder, measures the trees immediately after felling and records the data by punching the cards [cf. *For. Abstr.* 11 (No. 752)].

527. Solid Volume of Stacked Products

3112. DYER, H. L., THAXTER, R. T., and YOUNG, H. E. **Pulpwood cull and void tables [for Maine].** *Tech. Note Univ. Me. For. Dep.* No. 38, 1955. pp. 6.

Gives tables for determining the deductions to be made from stacked volume of cordwood, according to dimensions of bolt, for loss due to sap rot; also the number and proportion of 4-ft. bolts of different diameters per cord of different solid volumes.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 2474, 3122, 3137.

3113. RASPOPOV, I. M. K metodike izučenija proekcii kron derevjev. **[A method of studying the crown projection of trees.]** *Bot. Ž.* 40 (6), 1955 (825–7). 4 refs. [Russ.]

Describes a simple device consisting of: (1) A flexible steel ribbon which can be passed horizontally round the bole of a tree and fixed by means of two metal pegs so as to give a clearance of 5–10 mm. between ribbon and bark, forming a 'rail' along which a metal loop, with a tape measure attached, can slide freely. (2) A view-finder sight made in the form of a box 11·5 cm. long with a 45° mirror having a horizontal median hair-line, at one end, and a corresponding hair-line thread at the other, which is open. It is counterweighted and is carried on a handle with a universal mounting so that it will automatically take up a horizontal position. The plots to be studied are previously divided by strings into strips 2·5–5·0 m. wide and the position of each stem in the strips is recorded on a plan. To record a crown projection, (1) is fixed to the bole, and the observer then moves parallel to the boundary strings until the exact edge of the crown projection is seen through (2), when the tape is tautened and the distance read. Any number of readings are then taken by moving round the periphery of the crown. Taking 8–10 crown radii/tree, 30–35 crowns/hour can be recorded. For rough work, (1) can be used alone. The method was used in several-storeyed Oak forest in the Crimean Forest Reserve to correlate the distribution of regeneration with crown cover, the crowns of each storey being plotted with different colours on separate transparencies. This illustrated very clearly the prevalence of seedling regeneration of Oak, Ash and *Carpinus betulus* in the lighter places, and coppice regeneration of the same species under canopy. Lime and *C. orientalis* seedlings were found in openings and under canopy, and Beech seedlings usually only under canopy. In stands of density 0·3–0·2, regeneration of tree species was absent in the openings.

3114. MILETIĆ, Z. Istraživanja širenja (ekspanzije) kruna u prebirnoj sastojini bukve. **[Investigations on the spread (expansion) of crowns in a selection stand of Beech.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (5–20). 6 refs. [Serb.serb.g.]

Studies in 1952 on a 1-ha. plot (ca. 970 m. alt.; mainly irregular selection, with vestiges of regular high forest; 400 stems > 7·5 cm. diam.; b.a. 31·712 sq. m.; volume 372·529 cu.m.) led to the following conclusions: (1) the absolute height increment of stem decreases as the d.b.h. increases; (2) annual height increment varies, with d.b.h. class, between 3·5 and 16·5 (mean 10·4) cm.; (3) the culmination of m.a.i. occurs in the 25-cm. d.b.h. class at 76·6 years; (4) crown diameters (*D*) increase uniformly as the d.b.h. increases; (5) the c.a.i. of *D* varies from 2·8 to 6·6 (mean 4·6) cm.; (6) culmination of the m.a.i. of *D* occurs in the 30-cm. d.b.h. class at 93 years; (7) crown depth averages $D \times 2{\cdot}26$; (8) the c.a.i. ratio of *D* to d.b.h. varies from 10 to 26, less variation being found in the higher d.b.h. classes. The importance is stressed of the '*temps de passage*' for the evaluation of the relative age and better understanding of various structural and other characteristics of selection stands.

3115. SAGREIYA, K. P. **Single-stem silviculture. (Specific uses of the 'normal' N/D curve.)** *Indian For.* 81 (12), 1955 (753–64 + 7 gphs.).

[Cf. *For. Abstr.* 13 (No. 3832).] Suggests the use of the 'normal' N/D correlation for Teak of coppice origin in the same manner as the N/V correlation has been used by O'Connor for solving a variety of specific problems connected with thinning regimes, in his paper on *Forest Research with special reference to Planting Distances* submitted to the British Empire Forestry Conference, South Africa, 1935. A simpler notation has been used. Part I deals with definitions and the theory involved. The basic graph *A* gives the normal N/D curve, the free growth zone, the suppression zone and the normal N/D year-lines. Suppression and response are mathematically expressed and it is shown how the crop-diameter at any age under specified suppression or response could be arrived at. The basic graph *B* gives the correlation between suppression and response. Part II deals with the application of the two basic graphs to specific problems, viz. (i) the shortest rotation at which the largest number of *élites* could attain a desired size; (ii) the largest number of *élites* that could be grown per acre to obtain the maximum volume without thinnings; (iii) the optimum thinning regime to obtain the highest total yield of the largest size of poles; (iv) the effect of competition between *élites* on the total yield; (v) the effect of one delayed thinning on the total yield. How allowance for increase in crop-diameter after a thinning and the true relationship between the coefficients of suppression and response could be made, is also shown.

Part III describes how plots could be laid out and measured to obtain the basic N/D year-lines, normal N/D curve, and a graphical correlation between suppression and response. It is urged that the theory outlined be tested by research workers. *Author's summary.*

3116. MACLEAN, D. W., and BEDELL, G. H. D. **Northern clay belt growth and yield survey.** *Tech. Note For. Br. Can.* No. 20, 1955. pp. 31. 13 refs.

This survey was undertaken as an additional test of the stand density index (s.d.i.) method for growth and yield determination. Previously, an extensive trial carried out in the Nipigon area of north-western Ontario had given encouraging preliminary results [cf. *For. Abstr.* 14 (No. 2528)] but difficulties were encountered in obtaining a proper distribution of sample plots. The Northern Clay Belt, being more uniform, proved to be a much more satisfactory working area, and afforded a good sample distribution. Six forest site types, representing about 80% of the forested area, were sampled by a total of 339 $\frac{1}{5}$-acre sample plots, or their equivalents, using the same site classification as in the Nipigon survey [cf. *For. Abstr.* 12 (No. 832)]. Lesser vegetation types were also considered, and the most common described. Dominant-height/age curves are shown for Black Spruce and Trembling Aspen. The height growth of both these species is at its maximum on moist soils. Total and merchantable volumes are presented for unit s.d.i. and one-square-foot basal area, illustrating the relative productivities of the different forest site types. These provide for volumetric estimates of stands of known density, but they should not be used for yield prediction except for very short periods, as they do not, in themselves, allow for changes in density and composition. The plots will be remeasured after 10 years and a firm basis for predicting these changes will then be presented. This can, therefore, be considered as another progress report in the growth and yield studies being carried out by the Federal Forestry Branch. *From authors' summary.*

54. Assessment of Site Quality

See also No. 3116.

3117. LÅG, J. Undersøkelse av skogjorda i Telemark fylke ved Landsskogtakseringens markarbeid sommeren 1954. **[Investigations on forest soils in Telemark county, Norway, in connexion with the field work of the National Forest Survey.]** *Medd. norske Skogforsøksv.* 13 (2) (No. 45), 1955 (169–224 + 1 map). 17 refs. [Nor.nor.e.]

In studies of depth and origin of soil material, profile type and mechanical composition on circular sample plots in productive forest, nearly $\frac{1}{2}$ the plots were on soil material > 70 cm. deep and nearly $\frac{1}{4}$ on soil < 20 cm. deep. A close relationship was found between soil depth and site class. On the shallowest soils none of the plots were in site class 1, 0·4% in site class 2, and 82% were in site classes 4–5, and on soils > 70 cm. deep 27% were in classes 1–2, and 23·8% in classes 4–5. Correlations between depth and site class are clearer when altitudinal zones are treated individually. Site class is also affected by gradient, increasing gradient usually giving a better site class. The vegetation types *Vaccinium vitis-idaea, Calluna vulgaris* and lichen predominate on shallow soils, and the 3 types, forest rich in grasses and herbs, forest rich in mosses with some herbs, and forest rich in *V. myrtillus* with *Dryopteris* are much commoner on deep than on shallow soils. Scots Pine is better represented on shallow and Norway Spruce on deeper soils. Trees are rather older on shallow than on deep soils, e.g. 63·5% of plots with soil depths 0–20 cm. bear forest over 80 years old, while the figure for soil depths over 70 cm. is 43·8%; age also generally increases with increasing altitude. Stand density tends to increase with increasing soil depth. Investigations on plots in Grenland show that > $\frac{2}{3}$ are on morainic and > $\frac{1}{3}$ on residual material; > $\frac{2}{3}$ have podzol profiles (8·2% belonging to site classes 1–2) and > $\frac{1}{3}$ brown-earth profiles (66·3% in classes 1–2). Plots on lichen, *Calluna* and *V. vitis-idaea* sites have practically no brown earth. Forests rich in grass and herbs, or rich in mosses with some herbs occur on 6·7% of the podzolic plots and 71% of the brown-earth plots. Podzol profiles are about equally frequent in Pine and mixed coniferous forests, fewer in other mixed forest, and fewest in Spruce, while brown-earth profiles are commonest in Spruce. Podzol profiles and the proportion of wet peat soils increase with increasing altitude. Brown-earth plots become more frequent with increasing gradients. There are explanatory notes in English to tables and maps.

3118. VUCETICH, C. G., and WESTON, G. C. **The growth of exotic forest trees on certain soils at Tairua forest, Coromandel.** *Abstr.* from *Proceedings of the 1st Conference, New Zealand Society of Soil Science, Auckland 1954*, 1954 (5–6). H.S.B.

A description of the volcanic soils of the region, their topography, drainage etc., in connexion with an investigation to assess the progress and prospects of the 9 principal exotic Pines which have been used to plant about one third of the 46,000 acres of State Forest. Soil, site, and stand factors were appraised on 35 plots of 0·1–0·5 acres, timber volumes calculated, and the volume m.a.i. taken as the chief criterion of success, but as plantations are at most only 27 years old, information is necessarily provisional. *P. radiata*, fairly extensively planted, has generally done well, but on the strongly leached silt-loam of slopes, it is now, after 23 years, declining in vigour. *P. taeda* surpassed it at 18 years on some soils. *P. pinaster* appears promising for poor soils and difficult sites.

3119. LEVY, J. W., and SUTHERLAND, C. F. **The soils problem in reforestation in Northland.** *Abstr.* from *Proceedings of the 1st Conference, New Zealand Society of Soil Science, Auckland 1954*, 1954 (3–4). H.S.B.

A short description of the country, its geology, climate, original vegetation and the resultant soil types (mostly warm, heavy clays with thin topsoils and low subsoil fertility, some podzolized) is given in connexion with an investigation into the correlation of soil types and the growth of 7 Pine species, viz. *P. radiata, P. caribaea s.l., P. taeda, P. palustris, P. pinaster, P. patula*, and *P. nigra* var. *calabrica*. Stands aged 10 to 33 years were examined, and m.a.i. at 10 years taken as the index. Physical soil condition, particularly drainage, appeared more important than natural fertility. The presence of strongly gleyed horizons or a hard pan at a depth of 2 ft. often caused tree collapse even after initial good growth. *P. pinaster* was healthy and vigorous

on all soils examined except those strongly podzolized with massive pans. No soil appeared particularly suitable for *P. nigra* var. *calabrica*.

56. Increment. Development and Structure of Stands

See also Nos. 2522, 2524, 2526, 2638, 2647, 2671–3, 2683, 2685–6, 2772, 2781, 2794–7, 2815, 2827, 2947, 3036, 3039, 3041.

3120. HINDS, H. V. **The growth of *Pinus radiata* in unthinned stands.** *N.Z. J. For.* 7 (2), 1955 (63–70). 7 refs.

The variation in growth of *P. radiata* on different sites in New Zealand is discussed. Comparison is made of tree mortality in the pumice region of the North Island with that experienced in other parts of the country. Some observations are made on the incidence of malformation and on the yield to be expected from unthinned 30-year stands. *Author's summary.*

3121. SCHOBER, R. Die Ertragsleistung der Nadelhölzer in Grossbritannien und in Deutschland —verglichen nach der neuen britischen Ertragstafel von F. C. Hummel und J. Christie, 1953. **[Yield of conifers in Great Britain and Germany—compared on the basis of the new British yield tables of F. C. Hummel and J. Christie, 1953.]** *Forstwiss. Cbl.* 74 (1/2), 1955 (36–59). 21 refs. [G.g.]

A comparison is made between the new British yield tables and those for north-west and southern Germany, and some conclusions are drawn as to comparative growth of Spruce, Douglas Fir, Pine and Larch in the two countries.

3122. SATOO, T., NAKAMURA, K., and SENDA, M. **[Materials for the studies of growth in stands. 1. Young stands of Japanese Red Pine [*P. densiflora*] of various density.]** *Bull. Tokyo Univ. For.* No. 48, 1955 (65–90). 44 refs. [Jap.jap.e.]

The growth on plots of similar site quality but planted at spacings of 0·5, 1·0, 1·5, and 2·0 m. is analysed. Seedlings (1 + 0) were planted in 1938 and measured in 1950; additional data were taken in 1953. The mean d.b.h., and stem volume, m.a.i./tree, vol. of branches per tree and per unit area, crown size, live crown ratio, weight of needles/tree, branch/stem ratio and estimated vol. of branches lost per tree, all fell with increasing stand density. Mortality, b.a. and stem vol./unit area, surface area of stem and estimated vol. of branches lost per unit area, stem form factor, % of stem vol./stem + branch vol., annual stemwood production per unit weight of needles, ratio of needles/branches etc., all rose with increasing stand density. Height, total volume of wood and weight of needles/unit area were not affected. Reineke's linear relation between the logarithm of diameter and the logarithm of trees/ha. was found to be true also for b.a., vol. of stem, of branches, of total wood, weight of needles, and of weight of tree without roots, each per tree. The widest annual ring, first found at the base of tree, moved upwards with age, and this occurred faster with increasing density. The weight of needles is ca. 12–13 metric tons/ha. regardless of density.

3123. SOEDIONO, J. Pengukaran bahan kaju kupas dari enam buah petak pertjobaan djabon. **[Measurement data from six sample plots of *Anthocephalus cadamba*.]** *Rapp. Bosbouwproefsta., Bogor* No. 72, 1955. pp. 10. 5 refs. [Jav.e.]

Data for the sample plots are given in tables and graphs with English legends. The wood is very suitable for matches, and the stem below the crown for veneer. The stem above the crown base is generally so irregular in form as to yield no timber. Timber volume can be increased by moderate thinnings. Sale of the timber for plywood would seem to be the most profitable use.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also No. 3095.

3124. FRITTS, H. C., and FRITTS, E. C. **A new dendrograph for recording radial changes in a tree.** *For. Sci.* 1 (4), 1955 (271–6). 5 refs.

Describes, with a photograph and scale drawings, the incorporation of a precise recording mechanism in a dendrometer mounting of the Daubenmire type [see *For. Abstr.* 7 (No. 446)] and gives sample recordings from the drum, and a reconstituted graph from these, of one season's radial growth in Beech. Accurate recording of differences of 0·0001 in. is claimed. The cost is $130.

3125. GHENT, A. W. **A guide to the re-alignment of off-centre increment borings.** *For. Chron.* 31 (4), 1955 (353–5).

Describes a guide card, by the use of which it is possible to make sure of hitting the centre of a tree with a second boring if the first has deviated to left or right.

3126. PRIMAULT, B., and KUHN, W. De l'opportunité d'utiliser les coefficients de corrélation en météorologie forestière. **[The use of correlation coefficients in forest meteorology.]** *Geofisica Pura e Applicata, Milano* 28, 1954 (246–60). 8 refs. [F.f.it.g.e.] L.S.

An analysis of figures given in an earlier paper, by the first author, on the influence of meteorological factors on forest growth [cf. *For. Abstr.* 15 (No. 1658)]. Except in the case of spring and total precipitation in 2 of the 5 stands examined, the correlation coefficients never even reached $\pm$ 0·5, and a substitution of the regression line for the mean in respect of annual tree growth did not improve results. Neither was a significant partial correlation found when two meteorological factors were considered simultaneously. On the basis of these findings and of theoretical considerations, including questions of general trend (e.g. decrease of growth with age), and delayed effects, the authors conclude that correlation coefficients are not suitable for the elucidation of such relationships, the existence of which is proved by experience, but that the comparison of graphs, and indices of co-variance, provide better tools.

3127. ERMICH, K. Wpływ czynników klimatycznych na przyrost dębu szypułkowego (*Quercus*

robur L.) oraz sosny zwyczajnej (*Pinus sylvestris* L.). Próba analizy zagadnienia. **[Effect of climatic factors on the increment of *Q. robur* and *P. sylvestris*. Attempted analysis of the problem.]** *Prace rol.-leśn. polsk. Akad. Um.* No. 68, 1953. pp. 61. 50 refs. [Pol.pol.e.russ.] Price *Zł*.12.

Results of measurements on 5 Oak and 10 Pine felled in S. Poland show that: (1) the diameter increment of *Q. robur* is affected by the relative air humidity in June-August and the total June rainfall; (2) the height increment is influenced chiefly by the minimum temperatures in August of the preceding year; (3) the diameter increment of *P. sylvestris* depends mainly on the rainfall in June, and its height increment mainly on the mean May–June temperature. *From author's summary.*

3128. BOGGESS, W. R. **Diameter growth of Shortleaf Pine and White Oak following a mid-season drought.** *For. Note Ill. agric. Exp. Sta.* No. 65, 1955. pp. 1.

Further measurements confirmed previous findings [cf. *For. Abstr.* 15 (No. 562)] that *Pinus echinata* resumed growth when the drought ended, but ceased again whenever soil moisture became deficient. *Quercus alba* did not resume effective growth when the drought ended (31 July).

3129. SCHOVE, D. J. **Droughts of the dark ages and tree-rings. (A.D. 714–835.)** *Repr.* from *Weather, London* 10 (11), 1955. pp. 4. 9 refs.

Ring width was analysed in timbers from a Saxon site near Southampton. After a study of references to drought in contemporary records a tentative dating is proposed.

3130. BOGGESS, W. R., and MCMILLAN, F. W. **Changing volume and taper of pole-size Shortleaf Pine in Southern Illinois.** *For. Note Ill. agric. Exp. Sta.* No. 66, 1955. pp. 4. 4 refs.

The volume of pole-size trees in young plantations changes rapidly within a relatively short period of years, and this change affects the time at which plantations may be thinned, since it determines the volume of material available for cutting. These facts are illustrated by data obtained from thinning studies in young *Pinus echinata* stands [cf. *For. Abstr.* 17 (No. 1570)]. The present report covers (1) changes in volume and taper, by diameter class, of trees at 13, 16, and 18 years of age; and (2) comparative data from row-thinnings made in 14- and 18-year plantations. The results show that basal area, when used alone, is not an adequate way of expressing increment and yield. The ratio volume (cu. ft.)/b.a. (sq. ft.) at 13, 16, and 18 years was found to be 10·84, 13·10, and 15·65 respectively.

3131. MIKULKA, B. Versuch zur zahlenmässigen Erfassung der Qualität von Waldbeständen. **[A study of the numerical expression of stand quality.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 31 (2), 1955 (349–420). 70 refs. [G.f.]

The author discusses at length the problem of expressing quality increment numerically. Taking advantage of the relatively stable relation between the prices of different assortments, he takes as his unit of value for Beech the average value of 1 cu.m. of firewood, and with it expresses the difference (due to particular qualitative factors) between the value of firewood and that of a tree, of a stand, or of stand increment. The object of production is taken to be a stem of 15 m. merchantable length, and actual increment is expressed in % of this ideal. It was found practicable to determine into which of two quality classes (not specified) the first three 5-m. logs of a standing tree fell, and a table was constructed to show the value of a standing tree according to the quality of its first 3 logs. Using these methods of determining value increment, he then investigated the effect of different degrees of thinning on value increment (heavy selective thinning, light selective thinning, no thinning). The results showed that volume increment was the same for all treatments, but that quality increment was decidedly greater in the most heavily thinned plots. Improved quality was confined to the dominants and co-dominants.

3132. MIRKOVIĆ, D. Istraživanje odnosa p_g/p_d pri primeni nekih formula za računanje procenata prirasta. **[Investigations on the p_g/p_d ratio as obtained from some increment percent formulae.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (21–36). 2 refs. [Serb.serb.g.]

Analyses the formulae of Pressler, Todorović [cf. *For. Abstr.* 13 (No. 4106)], Kunze, and Leibniz and finds that the values for the ratio (b.a. increment/d.b.h. increment) are respectively $\leqslant 2$; $\leqslant 2$; $\lessgtr 2$, and $\geqslant 2$. If one uses p_g^L obtained from Leibniz' formula and p_d^T obtained from Todorović's formula, the approximation $p_g^L = 2p_d^T$ is true within 2%. The formulae of Kunze and Pressler can be used for higher d.b.h. and small p_d values.

562. Volume Increment

See also No. 3099.

3133. ČOKL, M. O srednjih vrednostih prehodnih dob. **[Average values of the *temps de passage*.]** *Gozd. Vestn.* 13 (4), 1955 (114–20). 9 refs. [Sloven.g.]

A mathematical approach showing that only the harmonic mean of periods of recruitment is theoretically justified; owing to special conditions, however, the arithmetic mean has been used so far in Slovenia.

564. Forecasting Increment

See No. 3116.

566. Yield Tables and Their Construction

See also No. 3121.

3134. MACLEOD, W. K., and BLYTH, A. W. **Yield of even-aged fully stocked Spruce-Poplar stands in Northern Alberta.** *Tech. Note For. Br. Can.* No. 18, 1955. pp. 33. 28 refs.

No growth data have previously been available for this important forest type (*Picea glauca/Populus tremuloides*). In spite of the difficulty of preparing yield tables for mixed stands, an attempt is made, on the basis of 127 temporary sample plots, to provide tables suitable for the present stage of management in the area.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also Nos. 3114–6, 3130, 3147.

3135. TIKKA, P. S. Haapametsiköiden rakenteesta ja laadusta. 1. Rakenne. [**Structure and quality of Aspen stands. 1. Structure.**] *Commun. Inst. for. Fenn.* 44 (4), 1954 (1955). pp. 33. 41 refs. [Fi.e.]

A study was made of data from 31 sample plots in S. Finland, of which 17 were in pure Aspen (*a*), 7 in Aspen-dominated (*b*), and 7 in mixed stands (*c*), most of them on average *Myrtillus*-type sites. Natural thinning and mean d.b.h. showed similar trends in all types of stand. Up to middle age, the mean height of (*a*) and (*b*) was similar, but thereafter was much greater in (*b*). The height of Aspen in (*c*) equals that of (*a*) and (*b*) only in old age. Aspen has no competitors until mature or overmature, and then only Pine and sometimes Birch. Tables and graphs have English titles and legends.

3136. KWASNITSCHKA, K. Die Entwicklungsdynamik der Mischbestände auf dem Buntsandstein des Ostschwarzwaldes. [**The growth dynamics of mixed stands on bunter sandstone in the eastern region of the Black Forest.**] *Forstwiss. Cbl.* 74 (3/4), 1955 (65–87). 17 refs. [G.g.]

A study of a Spruce/Fir/Pine forest made in the Donaueschingen Forest District and based on historical records and on analyses of age classes, periods of suppression, stand structure, stem quality, intensity of thinning and frequency of regeneration.

3137. MILIN, Ž. Istraživanja elemenata strukture u bukovoj sastojini karaktera prašume u Južnom Kučaju. [**Investigations on the structural elements of a virgin-forest-type Beech stand at Južni Kučaj [Serbia].**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (37–72). 5 refs. [Croat.croat.g.]

Presents results of measurements on a 2-ha. plot in 1952 (d.b.h. of all stems > 12·5 cm., their height and the crown height, the horizontal projection of the crowns, and the relative position of the stems) and of grouping the stems into stem and crown classes, and draws conclusions regarding height curves, the number of stems in each d.b.h. class, crown depth, crown and stem diameters, proportion of dominant and suppressed stems, etc.

3138. WAHLENBERG, W. G. **An early test of levels of growing stock in Appalachian hardwoods.** *J. For.* 54 (2), 1955 (106–14). 16 refs. [Southeastern Forest Experiment Station, Asheville, N.C.]

Discusses, with tables and graphs, the differences in responses in increment and regeneration when virgin mixed Oak/other hardwoods are (*a*) clear cut; (*b*) cut to leave growing stock volumes (thousands of bd. ft.) of from 1 to 6; and (*c*) left uncut with volumes of 7–10 thousand bd. ft. The plots, laid down in 1937, were examined for regeneration 7, and for yield 15, years later. The study covers changes in composition and size-class distribution, growth in diameter of trees and in volume of stands, mortality and value increment. [Cf. *For. Abstr.* 15 (No. 2515).]

569. Increment; Development and Structure of Stands: Miscellaneous

See No. 3227.

58. Surveying and Mapping. Aerial Surveys

See also Nos. 2410, 2603–4, 2756, 3159.

3139. BOUTIN, J. Des instruments topographiques à main pour levés expédiés. [**Hand instruments for rapid topographical surveys.**] *Rev. for. franç.* 8 (3), 1956 (205–10 + 4 photos). [F.]

Describes several compasses, clinometers, and altimeters.

3140. KEVERS, G., and OSTYN, P. Les cartes d'utilisation des sols dans l'Est du Congo belge. [**Soil utilization maps in the eastern Belgian Congo.**] *Bull. agric. Congo belge* 46 (6), 1955 (1361–6 + 2 maps). 4 refs. [F.flem.]

Elaborates a legend for use on maps of this heavily populated mountainous country and illustrates it with two maps, one for actual use (bananas, annual crops, pasture, woodland) and the other for land-use capacity. The latter shows the soil series, types and phases by letters and their delimitations by broken lines. Covering these are colours representing 6 classes of recommended use and conservation management. All slopes > 45% are treated as forest land. [Cf. *For. Abstr.* 17 (No. 2371).]

3141. HEATH, G. R. **Pinpointing, a surveying technique for foresters.** *J. For.* 54 (1), 1956 (34–7).

Hints on locating ground points on aerial photos, and photo points on the ground, with illustrations of use, e.g. for road location, establishing random sample plots etc.

3142. ALDRICH, R. C. **A method of plotting a dotgrid on aerial photographs of mountainous terrain.** *J. For.* 53 (12), 1955 (910–3). 1 ref.

Describes the adaptation of a radial planimetric plotter for plotting a dotgrid, which eliminates errors due to scale differences and distortions in mountainous country.

3143. ALLISON, G. W. **An application of an aerial photo volume table to forest inventory work in British Columbia.** *For. Chron.* 31 (4), 1955 (366–8). 2 refs.

In 1953 a ground cruise was conducted in a Spruce/Alpine Fir/Lodgepole Pine forest in British Columbia, and at the same time an aerial-photo stand-volume table was compiled for the area. The method used was a multiple linear correlation analysis of ground volume obtained from the field plots, and measurements of tree height, crown diameter and crown density obtained from aerial photos of the same plots. The equation derived was Volume = 58·06 (tree height) ± 33·46 (crown diameter) + 40·57 (crown density) − 2653. Two years later a more extensive ground cruise was conducted over part of the same area. There was no significant difference between the total volume determined from the intensive ground cruise and that from an aerial-photo cruise which was accomplished in 7·5% of the time and at 12% of the cost of the ground cruise. [Cf. *For. Abstr.* 13 (No. 1451).]

3144. WEAR, J. F., and DILWORTH, J. R. **Color photos aid salvage of beetle-killed Douglas Fir timber as mapping technique is developed.** *Lumberm.* 82 (13), 1955 (88–9, 132–3).

Discusses the value of colour photographs, costs, developments since 1951, and equipment. On a plot covering some 3 sq. miles near Corvallis, Ore., which had been photographed in colour, 26 beetle-killed groups varying in size from 7 to 67 trees were examined from the ground. A comparison of the two counts group by group showed a standard error of 3·7 trees in the results from the photographs, equal to about 17·2% of the average ground count. The results indicate that most dominant and co-dominant, some intermediate, but probably no suppressed, beetle-killed trees can be counted from colour photographs. A special study near Corvallis in Douglas stands of different ages, on 92 one-fifth-acre plots, showed that on average only 3·3% of total volume was contributed by intermediate and suppressed crown classes, with a range of 0–22·2% for the individual plots.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 3115, 3152–3.

3145. ERASLAN, I. Umumî ve Türkiye orman amenajman bilgisi. **[Textbook of general and Turkish forest mangement.]** *Istanbul Üniv. Yay.* No. 642 (*Orm. Fak.* No. 33), 1955. pp. xvi + 351 + mimeographed German translation of contents list. 323 refs. [Turk.]

3146. ERASLAN, I. Yurdumuzda bugüne kadar kullanılan amenajman metodları ve kritiği. **[Forest management methods used up till now [in Turkey] and their critics.]** *Istanbul Üniv. Orm. Fak. Derg.* 4 (1), 1954 (96–133). 23 refs. [Turk.]

Discussed for the 3 periods: 1857–1917, 1917–37 and 1937–52. All but 3 of the references are Turkish.

3147. MILETIĆ, Ž. Ophodnjica i prirast. **[Felling cycle and increment.]** *Glasn. šum. Fak., Beograd* No. 8, 1954 (147–55). 4 refs. [Serb.serb.g.]

Investigates the influence of shorter felling cycles on the value and composition of the c.a.i. of a theoretically normal selection forest stand. The normal number of trees after felling (for felling cycles of 15, 10, and 1 years) was calculated in accordance with the author's formula [see *For. Abstr.* 15 (No. 2761)]. Other tables give the following calculated data: c.a.i. of the average tree of each diameter class; c.a.i. of the normal stand for the moment before felling, and after felling; mean values of these two increments, and the % contribution of each diameter class to the m.a.i. It follows from the analysis that, for a given stand structure before felling, shorter felling cycles result in a higher total wood production, containing a higher proportion of large timber; but the advantages of shorter felling cycles can be fully utilized only by very intense selection management, plus a dense network of permanent roads.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 3105, 3526–7, 3537–8.

3148. WILSON, F. W. **The management of farm woodlands.** *J. Land Agents' Soc.* 55 (4), 1956 (148–51).

Notes for land agents on the making of working plans etc.

3149. OUCHI, A. **[Studies on the management plan of private forestry (1st Report). The management plan of family farms.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 80, 1955 (1–52). [Jap.e.]

Most of the private forest in Japan forms part of combined forestry and agricultural enterprises. These farms are usually family concerns providing both subsistence and market products. Most of the land capital and labour is provided by the family, and forest operations are on a small scale. The objects of this study are an analysis of forest management as a part of the combined enterprise, particularly from the point of view of the aims of management, and methods for improving this management. A farm raising agricultural crops, silk, stock, and forest produce in the Saitama Prefecture served as a sample for this analysis and an improved working plan is sketched for it which includes conversion of coppice to high forest.

3150. SALBITANO, E. Sulla utilizzazione dei boschi appartenenti ai comuni e ad altri enti. **[The exploitation of communal forests and forests belonging to other public bodies.]** *Monti e Boschi* 7 (1), 1956 (29–32). [It.]

Makes suggestions for the drafting of a general working plan for the management of such forests pending the drawing up of the individual working plans now required by law.

3151. PETRINI, S. **Determining the possible yield.** *Skr. K. Skogshögsk., Stockh.* No. 21, 1956. pp. 9. 2 refs. [E.e.sw.]

Presents, and illustrates the use of, formulae for calculating the annual yield, using either compound or simple interest [cf. *For. Abstr.* 15 (No. 3915)], when the initial and final growing stock, increment, and period are known quantities.

3152. KRAHL-URBAN, J. Kiefern-Betriebszieltypen. **[Types of objective in managing Pine.]** *Forst- u. Holzw.* 10 (2–3), 1955 (23–6; 48–51). 34 refs. [G.]

As in his previous management studies for Oak and Beech [cf. *For. Abstr.* 14 (No. 225); 13 (No. 2008)], the author discusses distribution, silviculture, site requirements and stand types (according to site,

ground vegetation, and quality of timber produced) and distinguishes the following management types, giving for each the desirable sites, mixture %s etc.: (1) Pure Pine, and (2) Pine/hardwoods, chiefly on site classes II and III, managed for sawtimber, (3) predominantly pure Pine, usually on deep sandy soils, (4) Pine/hardwoods, subdivided into 3 subgroups, often on site class I, producing large but coarse, branchy stems, managed for building timber and pulpwood, (5) a Pine/Spruce type, producing sawtimber from both species, and (6) Pine/Birch types on poor or degraded sites often producing fuelwood only.

3153. WAGENKNECHT, E. Bestockungszieltypen für das nordostdeutsche Diluvium. [**Growing-stock objectives for the diluvial region of north-east Germany.**] *Arch. Forstw.* 4 (1), 1955 (11–65). 8 refs. [G.]

The state forest regulations of the German Democratic Republic require that working plan revisions shall establish for each subcompartment and its subdivisions clear long-term planning, going beyond the next 10-year period. Decisive considerations are production, growing stock, and regeneration objectives, those for growing stock, its composition and constitution, having an overriding importance. Site is the basis for choice of species, and these must be considered as to yield and biological characters. A first review should list species fulfilling production aims, soil and stand improvers, and those which for special reasons should be rejected. Information is also required on the method of growing—whether pure or mixed; mixed singly, or in pockets or groups; even or uneven-aged; fast with slower species etc. The simplest answers to these questions, it is considered, will be got from a consideration of 'growing-stock objective types' and the author proceeds to discuss 12 of these, each under its chief timber species and subdivided as follows: (1) Scots Pine (Pine/hardwoods, Pine with broadleaved underwood, Pine, Pine/Spruce); (2) Spruce (Spruce/mixed forest); (3) Larch (Larch/hardwoods); (4) Douglas Fir (Douglas, Douglas/Pine); (5) Beech (Beech/valuable hardwoods, Beech/softwoods); (6) Sessile Oak (Oak/Beech, Oak/Lime/Hornbeam); (7) Pedunculate Oak (Oak/Hornbeam, Oak/valuable hardwoods, Oak/Beech); (8) Red Oak (Oak/Beech, Oak/Lime/Hornbeam); (9) Ash (valuable hardwoods) (10) Alder (Alder coppice or high forest, Alder/valuable hardwoods); (11) Birch; (12), Poplar (Poplar with broadleaved underwood, Poplar). Each of these is discussed in detail with respect to site, soil and soil-water conditions, and mixtures both vertical and horizontal. Two tables (34 pages) summarize this discussion. The first deals with the above types in numerical order and gives for each the natural forest associations [cf. *For. Abstr.* 15 (Nos. 1209–10)] that indicate suitable sites. The soil, soil water and peculiarities of these sites are also tabulated and for each there are silvicultural notes chiefly indicating desirable mixtures and species to be excluded. The second table works from the site 'class' (groundwater-influenced, temporarily impeded, free-draining) to the same natural forest associations, and lists for each of these the admissible 'growing-stock objectives'.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 2667–8, 2772, 2782, 2798, 2803, 2827, 2915, 3041, 3131, 3549.

3154. CAMPBELL, R. A. **Does it pay to prune White Pine in the Southern Appalachians?** *Sth. Lumberm.* 191 (2393), 1955 (179–80). 3 refs. [Southeastern Forest Experiment Station.]

Twenty-four trees pruned in 1936 were cut and examined in 1955. The diameter of pruned knots varied from ¼ to 1 in., and healing time from 1 to 5 years. Pruning should be done as soon as potential crop trees can be chosen and they may be pruned in one or two operations without removing > ⅓ of the crown, usually when d.b.h. is 4–5 in. If trees are allowed to grow a clear 6-in. layer (i.e. for ca. 52 years after pruning, assuming a 3-in. diam. increment per decade) pruning should pay well in managed stands, even allowing for the wasted costs of pruning trees lost before maturity through mortality or thinning. [Cf. *For. Abstr.* 5 (p. 180).]

66. Costing of Logging Operations

See also Nos. 2843–4.

3155. BENIĆ, R. Kalkulacija ekonomičnosti u eksploataciji šuma. [**The costing of logging operations.**] *Repr.* from *Drvna Ind.* 6 (4/5; 6/8), 1955. pp. 20 + mimeographed English smry. 9 refs. [Croat.croat.e.]

After a detailed analysis and discussion of costs in general, the author applies the general principles to preliminary work, felling, and transport of logs and other wood products, with special reference to the problem of the average skidding distance. Relevant formulae are presented and numerous examples given.

3156. Custo da produção de pinho. [**Costs of production of Brazilian Pine [*Araucaria angustifolia*].**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (355–9). [Port.e.]

Gives costs of felling, transport and sawmilling, with the estimated price of timber per cu.m. based on an average monthly production of 350 cu.m. It is estimated that the need for transporting timber by lorry instead of by railway increases the price at the port by 57·62%.

67. Assessment of Financial Results; Bookkeeping and Accountancy; Business Statistics; Short-Term Planning and Financing

3157. ANDRADA, A. DE CAMPOS. O rendimento da Mata Nacional de Leiria. [**Yield from the Leiria National Forest.**] *Estud. Inform. Serv. flor. aqüic. Portugal* No. 58-*E*3, 1955. pp. 16. [Port.] Limited distribution.

Presents figures for production of timber, costs and returns over the period 1947–54.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

See also No. 3503.

3158. **The Swedish Forest Service.** Swedish Forest Service, Stockholm. 1956. pp. 45. [E.]

An illustrated account of its history, organization, economic policy, forest area and growing stock, agriculture, forest district activities, personnel, shooting and fishing, and protection of nature.

684. Labour Management

See Nos. 2790, 2844.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

3159. BROWN, W. G. E. **Roads and land.** *Timber of Canada.* 17 (2), 1956 (21–7, 34). [For. Res. Div. For. Branch Dep. Northern Affairs and Natural Resources, Ottawa.]

Discusses the influence of bedrock, topography, profile, depth and drainage of soil on the choice of road location, and the use, in this choice, of aerial photos, giving as examples 3 Quebec land types illustrated by aerial and horizontal photographs and sectional diagrams.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

71. Marketing of Forest Products: General

3160. SANTO, P. SALES DOS. A indústria madeireira em face da situação econômica do país e do comportamento dos mercados externos. Relatorio apresentado à Junta Deliberativa do I.N.P. pelo Sr. Pedro Sales dos Santos, Presidente da Autarquia. **[The timber industry in relation to [Brazil's] economic situation and the state of foreign markets. Report presented to the consultative assembly of the I.N.P. by Sr. Pedro Sales dos Santos, President of the organization.]** *Brasil madeireiro* 11 (109), 1955 (4–27). [Port.]

In addition to financial and administrative matters, the report includes a review of markets in Argentina, Great Britain and the U.S.A., an account of agreements with the state of Paraná—with respect to reforestation (in which a project is reported for establishing a new research station for work in species of commercial value), and an account of afforestation work by the I.N.P. during the years 1952–54.

3161. NOMURA, I. **[Studies of the timber market in Japan.]** *For. [industr.] Econ., Tokyo* 8 (10–12), 1955 (24–41; 15–22; 26–31). [Jap.]

Chiefly a study of the structure of the timber market, wholesale and retail, in Tokyo itself, and its sources of supply.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also Nos. 3444, 3517.

3162. **Yearbook of forest products statistics.** FAO, Rome. 1955. pp. 161. [E.F.Span.] Price $2·50.

Contains information from more than 120 countries for 1954. Data for 1953, revised as necessary, are also included.

3163. **Wood requirements in the Near East.** *Unasylva* 9 (4), 1955 (173–80).

A paper prepared for the Teheran session of the Near East Forestry Commission. The following countries are considered: Afghanistan, Cyprus, Egypt, Ethiopia, Iran, Iraq, Lebanon, Libya, Pakistan, Saudi Arabia, Syria, Turkey and Yemen.

3164. **Forest utilization and research. Survey of wood use in Puerto Rico.** *Carib. For.* 16 (1/2), 1955 (10–11). (*15th Rep. U.S. Trop. For. Res. Cent. 1954.*)

Present consumption of native timber in Puerto Rico is less than 850 million bd. ft. annually. Use of native timber is diminishing every year, owing to inefficient logging and milling techniques and to lack of knowledge of the woods and their uses. Some figures for imported timber are presented.

3165. **The production, importation, and marketing of hardwood plywood in the United States: information obtained in connection with the Tariff Commission's 'Report on Escape-Clause Investigation No. 39 under the provisions of section 7 of the Trade Agreements Extension Act of 1951' published June 2, 1955.** U.S. Tariff Commission, Washington. 1955. pp. 106.

3166. **Hardwood plywood: Report on Escape-Clause Investigation No. 39, under the provisions of section 7 of the Trade Agreements Extension Act of 1951.** U.S. Tariff Commission, Washington. 1955. pp. 25 + 15 tbls. + 4 gphs.

The investigation was to determine whether hardwood plywood was, as a result of customs treatment, being imported into the U.S. in such quantities as to injure the domestic industry.

74. Trade Policy

See Nos. 3165–6.

75. Trade Customs and Usages

3167. HERMANSEN, N. K. Sorterings- og handelsforhold i nogle europæiske lande. **[Grading and marketing practices in some European countries [Germany, Switzerland, Austria, Norway, Netherlands, Belgium, Luxembourg and Eire and Great Britain].]** *Dansk Skovforen. Tidsskr.* 39 (9), 1954 (502–22). [Dan.]

78. Economics of Transport

See No. 3156.

79. Economics of the Wood Industries

See also Nos. 3156, 3444.

3168. LATHAM, B. **The growth of the timber industry in Canada. British Columbia.** *Wood* 21 (2), 1956 (54–6).

Notes covering 18th-century exploitation of spars, masts and timber for S. Pacific ports and Admiralty stations; sawmilling; effects of arrival of C.P. Railway 1886 and Panama canal 1914; statistics of production; effects of world wars: preference and tariff agreements.

3169. ALFARO G., O. Importancia y posibilidades de la industria de la celulosa y papel en Sud-America. **[Importance and possibilities of the pulp and paper industry in South America.]** *Boletín Informativo Centro Nacional de Investigaciones de Café, Chinchiná, Caldas* 6 (71), 1955 (401–7). [Span.] E.M.B.

A general discussion with some data on the estimated production and profits from *Pinus radiata* plantations in Chile.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 2369–70.

3170. KOLLMANN, F. Das Institut für Holzforschung und Holztechnik in München. **[The Institute of Wood Research and Wood Technology, Munich.]** *Holz-Zbl.* 82 (33), 1956 (437–9). [G.]

A description of the new institute, its organization, personnel, equipment and plans for research. Departments for biology, anatomy and pathology of wood, with a sub-department for wood preservation, wood physics and industrial processes, mechanical technology of wood and composite materials, and mechanics and testing of wood and composite materials, are working, though not yet quite fully equipped, while that for wood chemistry has yet to be organized. Among the special equipment described is an apparatus for high-accuracy sorption measurements, and a drying kiln with high-precision control and measuring instruments.

3171. DGfH-Holztagung 1955. Die Holzforschung gibt der Holzwirtschaft neue Impulse. **[DGfH Timber Conference 1955. Wood research stimulates wood industry.]** *Holz-Zbl.* 81 (147), 1955 (1754–5). [G.]

Papers read at the annual conference of the Deutsche Gesellschaft für Holzforschung at Hamburg in Nov. 1955 included one by *H. Flemming* on wood research in Eastern Europe, mentioning *inter alia*: work by Svjatkov (Russia) on suction hoods for dust and chip removal; work by Perkitny (Poland) on the manufacture of sleepers from inferior and small timber by the Imperkol process (in which the hot coal-tar creosote used for impregnation simultaneously heats the glue joints, percolating through 5 × 6 mm. channels cut into the surface of the wood components); Czech work on the manufacture of a porous, oil-absorbent substance, suitable for machinery bases, from sawdust, synthetic resin and cooking salt, the latter being subsequently washed out; and a new simple process from the Eastern zone of Germany for testing surface smoothness from the size of a stain made by a carefully measured and carefully applied quantity of a viscous, wetting paste such as polystyrol.

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 2366, 2495, 2525–6, 2528, 2686, 2828.

3172. WANGAARD, F. F., STERN, W. L., and GOODRICH, S. L. **Properties and uses of tropical woods, V.** *Trop. Woods* No. 103, 1955 (1–139). 109 refs.

This part concludes the report, on density, green and air-dry strengths, shrinkage, air-seasoning behaviour, decay resistance, sources, availability and general characteristics, and evaluation of present and potential utilization, and brings the total of neotropical species described to 104 with limited data on another 22 species. There is an index to the 126 species of the whole report. [Cf. *For. Abstr.* 11 (No. 1074); 12 (No. 2965); 14 (No. 602); 15 (No. 3996).]

3173. D. Die Forst- und Holzwirtschaft von Franz.-Guayana. **[Forestry and wood industry in French Guiana.]** *Holz-Zbl.* 82 (27), 1956 (352). 6 refs. [G.]

Contains some figures on forest resources, sawmilling and exports, with a list of 31 indigenous timbers, giving commercial and scientific names, weights, colours, and uses.

3174. DAVILA OLIVO, G. Valores y utilidad actual y potencial de los bosques venezolanos. **[The value and actual and potential uses of the Venezuelan forests.]** *Bol. Ingen. for. Univ. Los Andes* 3 (10), 1956 (35–76). 12 refs. [Span.]

Lists species by alphabetical order of native names, grouped according to their uses as producers of (1) timbers (subdivided into utilization categories), (2) medicinal and insecticidal products, (3) fibres, (4) oils, resins, gums etc., (5) tannins, (6) edible fruits, nuts etc., (7) ornamental trees, (8) dyes, (9) fodder, (10) miscellaneous products, and also presents notes on the value and uses of wildlife in the forests.

3175. NORMAND, D. Atlas des bois de la Côte d'Ivoire. Tome II. **[Atlas of timbers of the Ivory**

Coast. Vol. II.] *Publ. Centre tech. for. trop.* No. 9, 1955. pp. 132 + 56 plates. [F.]

[Cf. *For. Abstr.* 13 (No. 590).] Vol. II covers the families Polygalaceae to Hypericaceae. The work will be completed in a third volume.

3176. D. Drei malaiische Hölzer: Kampfer, Jelutong, Merbau. **[Three Malayan timbers: *Cinnamomum camphora, Dyera costulata, Intsia bijuga.*]** *Holz-Zbl.* 82 (37), 1956 (493). 4 refs. [G.]

Commercial and native names, distribution, habit, timber properties and uses.

3177. **[Japanese woods.]** *Suppls.* to *Wood Ind., Tokyo* 11 (1–3), 1956. Each pp. 2. [Jap.] P.R.

Photomicrographs and tabulated data on mechanical and physical properties are included for the species: *Ostrya japonica, Juglans sieboldiana,* and *Paulownia tomentosa.*

3178. **Specimen woods Nos. 241–3.** *Suppls.* to *Wood* 21 (1–3), 1956. Each pp. 2.

Panga Panga (*Millettia stuhlmannii*); Mugonyone (*Apodytes dimidiata*); and Mukui (*Piptadenia buchananii*).

3179. La page des bois tropicaux. **[Tropical woods.]** *Rev. Bois Appl.* 10 (7/8; 11), 1955 (32; 29); 11 (1), 1956 (45). [F.] P.R.

Iroko (*Chlorophora excelsa* and *C. regia*); Zingana (Zebrano) (*Microberlinia brazzavillensis* and *M. bisulcata*); and Movingui (*Distemonanthus benthamianus*).

3180. Moabi. **[*Baillonella toxisperma.*]** *Bois For. Trop.* No. 45, 1956 (27–30). [F.]

3181. SANDERMANN, W., and FEHT, F. Einige chemisch-technische Untersuchungen über das Holz von Tola Branca. **[Some chemical and technological investigations on the wood of *Gossweilerodendron balsamiferum.*]** *Holz Roh- u. Werkstoff* 13 (8), 1955 (292–301). 22 refs. [G.g.] P.R.

The authors determined the following properties of wood: resin content; natural durability; ease of impregnation, and problems of surface treatment of the wood for outdoor use. The wood is fungus-resistant; when air-dried it is also resistant to termites, but kiln-dried wood is not. The heartwood was found to be a better base for paint coatings than Pine wood.

3182. **Properties of overseas timbers. Klinki Pine [*Araucaria klinkii*].** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 214, 1956 (2–3).

Distribution (New Guinea, 2000–5000 ft.), habit (150–280 ft. high with half this length of sound timber containing a great proportion suitable for 1st-class plywood) and properties. Uses and availability are covered. [Cf. *For. Abstr.* 16 (No. 2118); 17 (No. 3406).]

3183. **Properties of thinnings of home-grown Grand Fir (*Abies grandis*). Progress report 1—Consignment No. 830.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 11 + 8 photos. Limited distribution.

3184. **Properties of thinnings of homegrown Grand Fir (*Abies grandis*). Progress report 2—Consignment No. 835.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 12 + 8 photos. Limited distribution.

3185. PECHMANN, H. VON, and SCHAILE, O. Untersuchungen über die Holzeigenschaften japanischer Lärchen von bayerischen Anbauorten. **[Wood characteristics of Japanese Larch grown in Bavaria.]** *Forstwiss. Cbl.* 74 (3/4), 1955 (87–113). 12 refs. [G.g.]

Material of *Larix leptolepis* from 4 different districts was compared with that from *L. decidua* in the immediate neighbourhood with regard to progress of growth, weight of dry wood, distribution within the stem of different dry-weight values, width of growth rings, strength properties, chemical properties and natural durability. Early growth in *L.l.* is unusually rapid; in the first 10 years the growth rings are markedly broader than those of *L.d.* on comparable sites. Fast growing *L.l.*, particularly on good sites has, in the inner part of the stem, very light wood of moderate strength; the denser wood of the outer zones is comparable in weight and strength to *L.d.* from similar sites. In slow-grown *L.l.*, however, all the wood rivals in quality that of *L.d.* and is even superior in resistance to impact. *L.l.* heartwood has an attractive colour and remarkable natural durability. Chemical properties of the two species are much the same. In order to produce good quality timber, *L.l.* should be grown in much denser stands than *L.d.*

811. Structure, Identification

See also Nos. 2457, 2526, 3175.

3186. WILSON, T. K. **A simplified technique for securing wood samples.** *J. For.* 54 (1), 1956 (40). 4 refs.

For taking frequent samples (e.g. bi-weekly) without damaging the living tree, the author recommends a Swedish increment borer, which gives an adequate amount of wood for most purposes. Photos of transverse, radial, and tangential sections × 100 illustrate the possibilities.

3187. BOSSHARD, H. H. Der Feinbau des Holzes als Grundlage technologischer Fragen. **[The fine structure of wood as the basis of technological problems.]** *Schweiz. Z. Forstw.* 107 (2), 1956 (81–96 + 18 photos). 18 refs. [G.f.]

A lecture, reviewing the advances in the knowledge of wood structure made possible by the use of the electron microscope.

3188. **Electron microscopy of fibres.** *Nature, Lond.* 177 (4503), 1956 (318–20). 4 refs.

Summarizes papers and discussions at a small conference held at Leeds in Jan. 1956 by the Electron Microscopy Group of the Institute of Physics. Includes summaries of papers by *E. Frei* and *R. D. Preston* on the microfibrils of conifer tracheids, and by *H. W. Emerton* on macrofibrils of softwood tracheids.

3189. SCHWANKL, A. **What wood is that? A guide to the identification of home-grown and imported timbers with 40 actual timber samples.** Thames and Hudson, London. 1956. pp. 164 + 40 wood samples in pockets. Price 25*s*.

Translated by H. L. Edlin from the German, with an additional index of wood uses.

3190. GREGUSS, P. **Identification of living gymnosperms on the basis of xylotomy.** Akadémiai Kiadó, Budapest. 1955. pp. 263 + 350 plates + 7 tbls. in pocket. 171 refs. [G.] Price [£5. 0*s*. 0*d*.].

The text includes a glossary, the description of a phylogenetic system based on wood anatomy, and keys and descriptions of classes, families, genera and species. There are plates consisting of photomicrographs and drawings of sections of the 350 species covered.

3191. JACQUIOT, C. Atlas d'anatomie des bois des conifères. [**Atlas of the anatomy of the conifers.**] Centre Technique du Bois, Paris. 1955. In two volumes. pp. 133 + 64 plates. 23 refs. [F.E.]

The first volume consists of keys to genera and to the species of *Pinus*, and of descriptions and drawings of the species, and the second of photomicrographs of different sections of the individual species.

3192. MENON, P. K. B. **The wood anatomy of Malayan timbers: Commercial timbers: 1. Heavy hardwoods. 2. Medium hardwoods.** *Res. Pamphl. For. Res. Inst. Kepong* No. 18, 1955. pp. 19. 9 refs.

The first of a series of pamphlets on the wood anatomy of Malayan timbers, based on the study of minute structure. The following are dealt with: Balau (*Shorea* spp.), Red Balau (*Shorea* spp.), Bitis (*Madhuca utilis*), Chengall (*Balanocarpus heimii*), Dedaru (*Cantleya corniculata*), Giam (*Hopea* spp.), Kerangi (*Dialium* spp.), Merbau (*Intsia palembanica*), Resak (*Cotylelobium* spp. and *Vatica* spp.), Tembusu (*Fagraea* spp.), Kapur (*Dryobalanops* spp.), Kasai (*Pometia* spp.), Keledang (*Artocarpus* spp.), Kelat (*Eugenia* spp.), Kempas (*Koompassia malaccensis*), Keruing (*Dipterocarpus* spp.), Kulim (*Scorodocarpus borneensis*), Perupok (*Lophopetalum* spp.), Punah (*Tetramerista glabra*), Rengas (*Gluta elegans* and *Melanorrhoea* spp.), Simpoh (*Dillenia* spp.), and Tualang (*Koompassia excelsa*).

3193. LEBACQ, L. Le laboratoire à la disposition de l'exploitant forestier. [**The laboratory in the service of the forest exploiter.**] *Bull. agric. Congo belge* 46 (6), 1955 (1385–406). 14 refs. [F.flem.]

Gives numerical formulae for 44 Belgian Congo species keyed on parenchyma (vasicentric, dispersed, banded), vessels (size, number), rays (height, width, 1 to > 4-seriate), storeyed or not, and discusses a method, through sampling of the standing trees, of increasing the utilization range of little known species, quoting examples of probable application in turnery, sleeper chocks, helves, pipes etc.

3194. JOHNSTON, D. R. **Structure drawings to 'Specimen woods' Sheets 55–7.** *Wood* 21 (1–3), 1956 (19; 57; 94).

(55) Angelin (*Andira inermis*), Bitterwood (*Vatairea lundellii*), Sen (*Kalopanax* spp.), and Paldao (*Dracontomelum dao*).

(56) Japanese Walnut (*Juglans sieboldiana*), Kamassi (*Gonioma kamassi*), Katsura (*Cercidiphyllum japonicum*), and Elgon Olive (*Olea welwitschii*).

(57) Tali (*Erythrophleum guineense*), Muhuhu (*Brachylaena hutchinsii*), Panga Panga (*Millettia stuhlmannii*), and Mugonyone (*Apodytes dimidiata*).

3195. VASILJEVIĆ, S. Makroskopska gradja domaćih vrsta roda *Acer*. [**Macroscopic structure of [the wood of] *Acer* species growing in Jugoslavia.**] *Glasn. šum. Fak., Beograd* No. 7, 1954 (94–8). 8 refs. [Croat.croat.e.]

Lists characteristic macroscopic features of *A. obtusatum*, *A. pseudoplatanus*, *A. heldreichii*, *A. campestre*, *A. monspessulanum*, and *A. tataricum*.

3196. VASILJEVIĆ, S. O nekim razlikama u mikroskopskoj građi lignuma među domaćim vrstama roda *Acer*. [**Some differences in microscopic wood structure between *Acer* species in Jugoslavia.**] *Glasn. šum. Fak., Beograd* No. 8, 1954 (65–132). [Serb.e.]

An analysis of 1 stem each of *A. obtusatum*, *A. platanoides*, *A. heldreichii* and *A. monspessulanum*, 2 stems of *A. pseudoplatanus*, 3 stems of *A. campestre* and 4 stems of *A. tataricum*, showed that differences in the number of vessels/sq. mm. or the tangential diam. of vessels or lengths of mechanical elements were not statistically significant.

3197. LEMESLE, R. Nature histologique des éléments du bois secondaire chez les Bruniacées; leur intérêt au point de vue phylogénétique. [**Histological nature of the elements of the secondary wood of the Bruniaceae; their interest phylogenetically.**] *C.R. Acad. Sci., Paris* 241 (24), 1955 (1831–5). 3 refs. [F.f.] O.R.S.

Study of a number of species (*Brunia* spp.. *Staavia* spp., *Audouinia capitata*, *Tittmannia laxa*, *Linconia* spp., *Lonchostoma acutiflorum*) showed some primitive characteristics, e.g. the preponderance of long fibre-tracheids, oblique cross-walls with scalariform perforations, vessels often isolated and small. These contrast with the high development of the flowers of the family.

3198. LEMESLE, R. Mise en évidence de pseudo-trachéides dans le bois secondaire de quelques Bruniacées. [**Notification of the presence of pseudo-tracheids in the secondary wood of some Bruniaceae.**] *C.R. Acad. Sci., Paris* 242 (1), 1956 (165–7). 3 refs. [F.] O.R.S.

The xylem of *Audouinia capitata*, *Tittmannia laxa*, *Brunia stavioides*, *Staavia globosa* and particularly *B. laevis* was shown to contain pseudo-tracheids, already found in *Degeneria vitiensis* [see *For. Abstr.* 17 (No. 787)] in the form of long vertical rows of lignified parenchyma, consisting of 2–4 elongated cells with bordered pits. These pseudo-tracheids are little known among the angiosperms and may be considered an archaic survival.

3199. STERN, W. L. **Xylem anatomy and relationships of Gomortegaceae.** *Amer. J. Bot.* 42 (10), 1955 (874–85). 61 refs. O.B.D.

811.1. Anatomical Elements and Tissues

See also Nos. 3187–8, 3435.

3200. BÜCHER, H. Les discontinuités de structure des fibres naturelles. Structure lamellaire des fibres de bois et différentiation d'une paroi tertiaire. **[Discontinuity in the structure of natural fibres. The lamellar structure of wood fibres and the differentiation of a tertiary wall.]** [*Paper*] *8e Congrès de l'Association Technique de l'Industrie Papetière, Grenoble* 1955. pp. 10 + 1 plate. 16 refs. [F.f.e.g.] X.

Demonstrates the existence of an individual inner layer (the 'tertiary' wall) of the cell wall in wood fibres, and describes its morphology in some coniferous species.

3201. KAEISER, M. **Variations in fiber length of Eastern Cottonwood.** *Rep. U.S. For. Prod. Lab., Madison* No. 2047, 1956. pp. 4 + 1 dgm. + 1 tbl. 5 refs. P.R.

The average length of 100 fibres in each sample (18 samples for each of 4 *Populus deltoides* trees) ranged from 0·90 to 1·20 mm., the general mean being 1·081 mm. The average fibre length increased successively with the number of the ring from the pith, regardless of the amount of lean, while a further trend toward greater fibre length was shown in trees with a greater amount of lean.

811.2. Special Features and Abnormal Structure

See also No. 3271–2.

3202. KAEISER, M., and PILLOW, M. Y. **Tension wood in Eastern Cottonwood.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 149, 1955. pp. 9.

The following results were obtained from a study of 30-year trees. (1) At breast height, gelatinous fibres were concentrated on the upper side, and at middle and top heights on the lower side, of the leaning tree. (2) Trees with little lean (1°) had more gelatinous fibres at the top and those with greater lean more at b.h. (3) Gelatinous fibres increased with the degree of lean and were present in relatively large amounts in trees leaning 8–12° at b.h. Early removal of trees with $> 4°$ lean is recommended.

3203. NEČESANÝ, V. Anatomie reakčního dřeva listnáčů a submikroskopická morfologie jeho buněčných blan. **[Anatomy of the reaction wood of broadleaved species and submicroscopic morphology of its cell walls.]** *Repr.* from *Přírodovědecký Sborník Ostravského Kraje, Opava* 16 (2), 1955 (184–202 + 15 photos). 24 refs. [Cz.cz.russ.e.]

Macroscopic and microscopic studies were made of the anatomical structure of tension wood in × *Populus robusta, Ulmus effusa, Quercus robur, Fagus sylvatica,* and *Acer campestre,* along with a submicroscopic study (electron microscopy) of *Q. robur, F. sylvatica* and *A. campestre.* To obtain colour differentiation in sections, the author used a selective dye composed of malachite green and acid fuchsin, 1 g. of each being dissolved in 300 c.c. of 50% ethanol, the sections immersed in this solution for 10 min., rinsed in acidified 96% ethanol, then differentiated in a 3/1 mixture of xylene and crystalline phenol, washed in xylene, and embedded in Canada balsam. The tension-wood fibres had less highly lignified secondary walls than the normal wood; the outer layer was the most lignified and had a greater fibril angle. The fine structure of their walls is sometimes unusual; there are, for example, many thin layers in the secondary wall and the angle of the fibrils decreases towards the lumen. The 'tertiary' wall differs from the secondary wall only in the angle of the fibrils. Wood from the underside of bent stems does not differ from normal wood; where, however, it lies opposite to tension wood, it has fewer and shorter fibres with more highly lignified walls than those in normal wood. There appears to be some relation between fibril inclination and the degree of lignification.

3204. KLAUDITZ, W., and STOLLEY, I. Über die biologisch-mechanischen und technischen Eigenschaften des Zugholzes. **[Biological-mechanical and technological properties of tension wood.]** *Holzforschung, Berlin* 9 (1), 1955 (5–10). 17 refs. [G.g.e.] P.R.

Air-dry tension wood of Poplar has a higher tensile strength than air-dry normal wood, and the increase in tensile strength goes hand in hand with the increase in cellulose content. On the other hand, the tensile strength of green tension wood does not exceed that of green normal wood. Microscope studies showed that in green wood the hydrated cellulosic 'tertiary' wall layers are not subjected to tensile stress, since they are not firmly united to the adjacent secondary wall of the fibres. When failure occurs they may be seen to project, undamaged, from the other, broken layers of the wall. In air-dry tension wood, however, shrinkage of the tertiary layers causes them to adhere firmly to the secondary wall; hence they contribute to tensile strength and are broken together with the other layers when failure occurs.

3205. OLLINMAA, P. J. Havupuiden lylypuun rakenteesta ja ominaisuuksista. **[The structure and properties of coniferous compression wood.]** *Pap. ja Puu* 37 (11), 1955 (544–9). 48 refs. [Fi.e.] P.R.

Mainly a review of world literature on compression wood. Includes a brief account of a study by the author on the relation between excessive bending in the stem and the formation of compression wood, in a Pine of small diameter, illustrated by drawings.

811.4. Growth Rings. Early and Late Wood

See also Nos. 2965, 3212, 3228–9, 3425.

3206. SMITH, D. M. **Comparison of methods of estimating summerwood percentage in wide-ringed, second-growth Douglas Fir.** *Rep. U.S. For. Prod. Lab., Madison* No. 2035, 1955. pp. 8 + 1 photo + 3 tbls. 5 refs. P.R.

Macroscopic, or visual, measurements of the % of late wood gave a slight over-estimate compared with microscopic measurements that used a standard criterion for the boundary between early and late wood in the annual rings. Hand smoothing with a sharp knife and the application of a differential stain contributed significantly to accurate macroscopic determination of this boundary. The greatest

differences in % of late wood were obtained when persons of varying technical experience made the measurements. *From author's summary.*

3207. SMITH, D. M. **Relationship between specific gravity and percentage of summerwood in wide-ringed, second-growth Douglas-Fir.** *Rep. U.S. For. Prod. Lab., Madison* No. 2045, 1955. pp. 14 + 1 dgm. + 2 gphs. + 2 tbls. 10 refs. P.R.

For 96 dissected annual rings, the relationship between density and % of late wood was found to be linear over a range of 16–60% late-wood content. The density of the late- and early-wood portions was also linearly related to the % of late wood in the rings. The zero and 100% late-wood intercepts of the regression of density on % of late wood of whole rings do not give valid estimates of the mean density of early and late wood. *From author's summary.*

811.5. Sapwood and Heartwood

See No. 2965.

811.7. Phloem. Bark

3208. HUBER, B., and GRAF, E. Vergleichende Untersuchungen über die Geleitzellen der Siebröhren. **[Comparative investigations of the companion cells of sieve tubes.]** *Ber. dtsch. bot. Ges.* 68 (8), 1955 (303–10). 27 refs. [G.g.] O.B.D.

A hitherto unsuspected anatomical diversity in companion cells is demonstrated. Various types are described and their possible phylogenetic significance is discussed.

3209. YANAGISAWA, T., and KAWANISHI, T. **[On the rinds of four species in *Larix* genus.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 79, 1955 (125–44). 15 refs. [Jap.jap.e.]

A study of the thickness, anatomical structure and chemical composition of the bark of (*a*) *Larix leptolepis*, (*b*) *L. decidua*, (*c*) *L. gmelini* var. *olgensis* and (*d*) *L. gmelini* var. *japonica*, is presented. The object was to relate the results to known differences in resistance to disease and to damage by voles, and to clarify the characters studied in connexion with F_1 hybrids.

Up to 30 years of age, little difference was found in bark thickness. Anatomically, the most remarkable difference lay in the size and number of the resin canals of the inner cortex, (*c*) and (*d*) having distinctly larger and more numerous ones than (*a*) and (*b*). The barks of 36- to 42-year trees and 4-year seedlings of (*c*) and (*d*) had also distinctly more essential oil than (*a*) and (*b*), and these oils also differed in physical and chemical characteristics. The difference in amount and kind of essential oil may be the cause of varying resistance to disease and vole attack.

3210. JOACHIM, H. F. Die Rinde von Pappelarten und -sorten und ihre Eignung als Erkennungsmaterial für die Pappelbestimmung. **[The bark of Poplars as a diagnostic character.]** *Arch. Forstw.* 3 (7/8), 1954 (620–44). 12 refs. [G.g.]

On the basis of an examination of nearly 2500 trees of many species, varieties, forms and hybrids of the 4 main sections of the genus, the development of the young and mature bark, and the dependence of this on site, age, and position in the tree (vertical and horizontal) is traced. The literature is reviewed and the barks of each section are then described in detail with 46 photographs. The value of the bark in diagnosis is summarized as follows:—Species and varieties can be identified from the bark in only a few instances. The following have diagnostic barks: *Populus alba* var. *pyramidalis*, *P. tremula*, *P. trichocarpa*, *P. nigra*, *P. nigra* var. *italica*, × *P. robusta*, × *P. gelrica* and × *P. berolinensis*. Bark forms, on the other hand, with a few exceptions, serve to distinguish the sections of the genus. The importance of the bark in grading, protection and yield studies is discussed.

812. Physical and Mechanical Properties

See also No. 3402.

3211. SALLENAVE, P. Propriétés physiques et mécaniques des bois tropicaux de l'Union Française. **[Physical and mechanical properties of the tropical timbers of the French Union.]** *Publ. Centre tech. for. trop.* No. 8, 1955. pp. 126 + table. [F.]

Brings together test data on 412 tropical species from French territories in Africa, Asia, the West Indies, and the Pacific together with a detailed account of French test methods. The data are arranged alphabetically by species under families, and are given separately for different provenances where the same species is grown in more than one territory. There is also a table arranging the timbers in order of density.

3212. UGRENOVIĆ, A., and HORVAT, I. Istraživanja o tehničkim svojstvima smrekovine (*Picea excelsa* Lk.). **[Investigation on technical properties of *P. abies*.]** *Repr.* from *Anali Instituta za Eksperimentalno Šumarstvo Jugoslavenske Akademije, Zagreb* 1, 1955 (359–413 + 3 photos). 33 refs. [Croat. croat.e.]

Investigations were made on sample trees from forests in different parts of Bosnia and Croatia, from natural and from artificial stands, and from subalpine forests of Spruce (*Piceetum subalpinum*) and of Fir/Spruce (*Abieto-Calamagrostidetum piceetosum* = *Abieto-Piceetum calamagrostidis*). The following conclusions are drawn from tests on 2905 samples: (1) Annual-ring width, late-wood %, impact bending strength and compressive strength of Spruce from subalpine forests of Spruce and of Fir/Spruce are roughly the same. Oven-dry and basic density, and radial, tangential, and volume shrinkage are significantly higher in wood from Fir/Spruce forests. (2) Annual-ring width, [oven-dry?] density, basic density, radial, tangential, and volume shrinkage, and compressive strength are significantly lower, and impact-bending strength is significantly higher, in wood from natural selection forest than in wood from artificial forests. Late-wood % is roughly the same for both. (3) Annual-ring width and impact bending strength are significantly lower, and oven-dry density (o.d.d.) and compressive strength significantly higher, in Spruce from plantations on

Papuk Mountain (Voćin) than for those in the lowlands of the river Drava (Našice). Comparison of material from Gorski Kotar and Slavonia showed that annual-ring width increases and o.d.d., impact-bending strength and compression strength decrease, with decreasing altitude. (4) Variations in wood properties, sometimes significant, were found between Spruce from the 3 Bosnian districts Bugojno, Han Pijesak and Pale. (5) Spruce from Bosnia had greater annual-ring width, narrower late-wood, and lower impact-bending and compressive strength than that from Crotia; radial, tangential and volume shrinkage was similar for both.

3213. ***P[inus] elliottii* var. *elliottii*—inheritance of physical properties.** *Rep. Dir. For. Qd. 1954/55*, 1955 (24 + 1 gph.).

A study was made of the physical properties of the wood, and seasoning behaviour of the sawn product, from three 22-year-old *P. elliottii*—(*a*), (*b*), and (*c*)—which had been selected for breeding purposes on external morphological characters, and were blown down in a gale. Two open-pollinated progeny of (*c*), each 11 years old, were also included in the study. Little or no evidence of spiral grain was found in any of the trees. Provided that sawn material was free from pith, its stability and seasoning behaviour were entirely satisfactory. Pieces containing pith were subject to severe twist and were unsatisfactory for any use except low-grade case manufacture. In respect of longitudinal shrinkage, tree (*c*) was better than (*a*) or (*b*), and a close similarity in the trends of basic density and longitudinal shrinkage exists between (*c*) and its progeny. It is proposed to examine a range of parent trees and their progeny (selfed and cross-pollinated) for further evidence of the transmission of physical properties.

3214. JUKNA, A. D., and TILTINS, K. K. **[Physical and mechanical properties of Ash wood grown on first-quality sites in the Latvian SSR.]** *Izvestija Akademii Nauk Latviiskoĭ SSR* 1954 (6), (35–48). From *abstr.* in *Chem. Zbl.* 126 (33), 1955 (7810). [G.] L.S.

The [nominal?] density for 15% m.c. increases with height in the stem in the range 0·65–0·70 g./c.c. Other properties (graphed and tabulated) also change with height.

3215. PAUL, B. H., DOHR, A. W., and DROW, J. T. **Specific gravity, shrinkage, and strength of Tanoak.** *Rep. U.S. For. Prod. Lab., Madison* No. 2041, 1955. pp. 8 + 1 photo + 7 tbls. 3 refs. P.R.

Lithocarpus densiflorus from California was found to possess mean bending and compression strength values close to those of the best *Quercus* species tested at Madison. No excessive variations in density were found among samples from 2 heights of each of 5 trees examined. Volume shrinkage was rather high, and seemed to be associated with collapse of cells in many specimens. Transverse shrinkage was normal for wood of that density. *From authors' summary.*

3216. BURGESS, H. J., *et al.* **The timbers Keledang and Terap.** *Malay. Forester* 19 (1), 1956 (36–40). 3 refs.

Gives the results of tests on the physical, mechanical, and working properties, natural durability and preservative treatment, and defects, of the two types of timber. Keledang is a timber produced by all forest species of *Artocarpus* except the 3 species *A. elasticus*, *A. scortechinii* and *A. bracteata*, which are grouped under Terap. Terap also includes *Antiaris toxicaria* and *Parartocarpus triandra*.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also No. 3358.

3217. INOSE, O. **[Variation of the electric resistance of wood caused by compressive stress parallel to the grain.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (6–10). 9 refs. [Jap.e.] P.R.

Tables and graphs show that, with increase of load (range 20–3000 kg., specimen size 2 × 2 × 4 cm.), the resistance of the wood [species and moisture content not given] increased.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 2963, 3067, 3234, 3378–80, 3408–9.

3218. **Self-calculating moisture-content scale.** *For. Equipm. Note FAO* No. *D*.8.55, 1955. pp. 1.

Description and photograph of scales for weighing wood specimens before and after kiln-drying. After the second weighing, the m.c. of the specimen can be read off directly. The scales are manufactured by the Moore Dry Kiln Corp., Jacksonville, Florida.

3219. CHALK, L., and BIGG, J. M. **The distribution of moisture in the living stem in Sitka Spruce and Douglas Fir.** *Forestry* 29 (1), 1956 (5–21). 13 refs.

Equilibrium in the moisture content of the stem appears to be reached at a given % of saturation rather than at a % based on the dry weight, and this method of expressing moisture content eliminates many of the fluctuations apparent with the latter. Summer moisture content in Sitka Spruce was highest on the site with the highest rainfall and lowest with the lowest rainfall. It decreased in late summer, suddenly in Sitka Spruce in August and gradually in Douglas Fir. There was a sharp moisture gradient from cambium to heartwood, the saturated zone being very narrow except on the wet Sitka Spruce site. In the Douglas Fir it appeared that water could be withdrawn from the layers just behind the transpiration stream faster than it could be replaced, leaving this zone drier than the surrounding layers. Lateral root pruning in Douglas Fir led to the drying out of a narrow strip of tissue in the stem. *From authors' summary.*

3220. GARCIA, J. J. M. Conteúdo de umidade das árvores vivas. **[Moisture content of living trees.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (274–81). [Port.e.]

Moisture content was determined in samples taken from the heartwood and sapwood of 28 living species, (1) at the base, and (2) at a height of 4 m. These values are correlated with those for density and porosity. The general tendency is for moisture to be higher at the base of the tree than at 4 m.

height, and higher in the sapwood than in the heartwood. There were, however, exceptions to both rules.

3221. BOSSHARD, H. H. Über eine neue Methode zur Messung der Schwindungsanisotropie im Holz. [**A new method of measuring shrinkage anisotropy in wood.**] *Naturwissenschaften* 43 (3), 1956 (54–5). 6 refs. [G.] O.R.S.

Wood sections can be dried by high frequency for periods of a few minutes to 2 hours. A stereomicroscope is used; the microscope stage is replaced by a glass plate incorporating 2 wire electrodes set in parallel grooves, with the section of wood between them. The cover slip rests on the electrodes and does not touch the wood. Sections of *Tilia glabra* and *Quercus borealis* 40 μ thick were dried in this manner. Changes in dimension, expressed as a % of the dry dimensions, for both radial and tangential directions in longitudinal and cross sections are tabulated, with their ϵ values (ϵ = the anisotropy coefficient). The wood dried very evenly by this method and no stresses were set up. Shrinkage was greater in cross sections than longitudinal sections; ϵ values were 15% less in the cross section than in longitudinal section for Lime and 70% less for Oak.

3222. ENČEV, E. A. Vărhu săsăhvaneto i nabăbvaneto na dărvesinata. [**Shrinkage and swelling of wood.**] *Repr.* from *Izvestija na Instituta za Gorata, Otdelenie za selskostopanski Nauki, Bălgarska Akademija na Naukite, Sofia* No. 1, 1955 (123–42). 17 refs. [Bulg.russ.g.]

Assuming (for the ideal case of shrinkage or swelling without inner stresses and plastic deformations) that α_v (total volumetric shrinkage in %) = uR (u being the moisture content (m.c.) at fibre saturation point (f.s.p.), and R, the basic density in g./c.c.), and that β_v (total volumetric swelling in %) = ur_o (r_o being the oven-dry density), the author derives different sets of equations for shrinkage (and swelling) per 1% m.c. difference, and for shrinkage (and swelling) between two given m.c. values. Since the m.c. at f.s.p. varies from 20% (Robinia heartwood, Yew) to ca. 36–40% (Lime), the general formula suggested by Kollmann to calculate the shrinkage from green condition to 18% m.c. on the basis of volumetric swelling (viz. $\alpha_{v18} = 40\ \beta_v/(100 + \beta_v)$) gives very inaccurate results when m.c. at f.s.p. $\neq$ 30%. Owing to the linear relationship between shrinkage (swelling) and m.c., it is possible to calculate the shrinkage (swelling) coefficient, per 1% m.c. difference, from two volume data for two m.c. values. It is recommended that Bulgarian wood species be classified in 6 groups having the following volumetric shrinkage coefficients: < 0·40; 0·41–0·45; 0·46–0·50; 0·51–0·55; 0·56–0·60, and > 0·60% (per 1% m.c. difference).

3223. KNIGHT, R. A. G., and NEWALL, R. J. **Moisture relations of composite wood products. Progress report 28—October, 1955. The superficial movement of plywood.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 13. Limited distribution. P.R.

3224. STAMM, A. J. **Swelling of wood and fiberboards in liquid ammonia.** *For. Prod. J.* 5 (6), 1955 (413–6). 21 refs.

Because of collapse on drying after soaking in liquid NH_3, unlined tanks of wood or fibreboard were found unsuitable for insulating containers for this substance. The penetration of NH_3 is much reduced by lining the containers with a light rubber dam, which also minimizes the swelling and collapse on drying of wood.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 3207, 3267.

3225. SMITH, D. M. **A comparison of two methods for determining the specific gravity of small samples of second-growth Douglas-Fir.** *Rep. U.S. For. Prod. Lab., Madison* No. 2033, 1955. pp. 13 + 1 photo. P.R.

A comparison between the maximum-moisture [cf. *For. Abstr.* 16 (No. 947)] and water-immersion methods of determining the specific gravity (sp. gr.) of small wood samples showed an average difference of < 1% of the mean water-immersion sp. gr. The maximum-moisture method assumes a constant for the density of cell-wall substance, but the nature of the formula used is such that reasonable latitude in the assumed value for this cell-wall constant contributes little error to the determination of the sp. gr. of small wood samples. From the standpoint of technique, the maximum-moisture method is definitely superior, since it eliminates the determination of the weight of the sample in water. Because of its simplicity, the maximum-moisture method is well suited to large-scale growth-quality studies. *Author's summary.*

3226. ZOBEL, B. J., and RHODES, R. R. **Relationship of wood specific gravity in Loblolly Pine (*Pinus taeda* L.) to growth and environmental factors.** *Tech. Rep. Tex. For. Serv.* No. 11, 1955. pp. 32. 28 refs.

The study, based on some 7000 trees from vigorous second-growth stands in E. Texas, was designed to determine the relationship, if any, between specific gravity (sp. gr.) and (*a*) rate of growth, (*b*) age of tree, (*c*) moistness of site, (*d*) length of clear bole, (*e*) site index, (*f*) soil characteristics, (*g*) late-wood %, and (*h*) stand density expressed by basal area (b.a.). The data were analysed statistically. The correlation with (*a*) was very slight, and there was little or none with (*b*) or (*d*), but a high correlation with (*g*). There appears to be some correlation between high values for (*e*) and low ones for sp. gr., but this is significant only when one genotype is involved. There appeared to be no correlation with (*f*) or (*h*), and a slight correlation with (*c*) only when genetic differences were ignored. The general conclusion is that genetic factors probably play a large role in producing differences in sp. gr. [Cf. *For. Abstr.* 15 (No. 2833).]

3227. HIRAI, S. [**Studies on weight-growth of forest trees. V. *Pinus strobus* Linnaeus of the Tokyo University forest in Hokkaido.**] *Bull. Tokyo Univ. For.* No. 48, 1955 (221–35). 12 refs. [Jap. jap.e.]

The basic density in kg./cu.m. is shown in tables and stem-analysis diagrams against height and age, and the increments (total, current annual and mean) in volume and weight are graphed and tabulated for ages from 5 to 39 years, for each of five trees. Basic density varies less in this species than in *Larix leptolepis*, *Picea abies* and *Cryptomeria* already studied [cf. *For. Abstr.* 15 (No. 2834)]. In the Pine, wood is generally heavier in the centre of the stem, the heaviest being at the base and top. The outermost layers of the base are heavier than the adjoining layers within. Basic density and ring width were not correlated. The total weight increment divided by the total volume increment is 270–313 kg./cu.m. with a mean of 291. Total produce is 109,695 kg. and 376·91 cu.m./ha., representing m.a.i. of 2812 kg. and 9·66 cu.m./ha. in a crop in which c.a.i. has not yet culminated.

3228. SAYA, I. Osservazioni sulla densità del legno di ailanto in rapporto allo spessore degli anelli di accrescimento. **[The density of *Ailanthus altissima* wood in relation to the width of growth rings.]** *Ital. for. mont.* 10 (6), 1955 (271–2 + 5 photos.) 2 refs. [It.it.f.]

The author analysed samples of wood from the penultimate growth ring of a 4-year-old tree at different heights (50 cm., 1, 2, 3, and 4 m.) and found a correlation between the width of ring and the % of different wood elements (fibres, rays, vessels, and parenchyma). The % of fibres decreased from 79·96 at 50 cm. to 67·8 at 4 m., and the width of ring from 12 mm. to 3 mm.

3229. BENIĆ, R. Širina goda kao činilac kakvoće poljske jasenovine. **[Growth-ring width as a factor in the quality of *Fraxinus angustifolia* wood.]** *Šumarstvo* 8 (9), 1955 (534–45). 7 refs. [Croat. croat.e.g.]

Results of tests show that the width of growth rings of *F. angustifolia* is a reliable index of density and hence of the technical wood properties related to it. Formulae are derived for the correlation between oven-dry density (and basic density) and growth-ring width. The density of late wood is ca. 1·25 times that of early wood. The technical rotation of *F. angustifolia* in Serbia is ca. 80 years.

812.7. Strength Properties

See also Nos. 2926, 3185, 3204, 3330, 3337–41, 3363, 3376, 3427.

3230. ARMSTRONG, F. H. **The strength properties of timber: the 2-cm. standard for tests of small clear specimens.** *Bull. For. Prod. Res., Lond.* No. 34, 1955. pp. 27 + 2 photos. Price 2*s.* 6*d.*

Describes the procedure adopted for the 2-cm. scheme for testing small clear specimens of timber. The methods of test used for the determination of strength properties are given and the correlation of these tests with those from the 2-in. scheme is discussed. Strength data from tests on 29 hardwoods and 12 softwoods, supplementary to previously published data for 2-in. test specimens [see *For. Abstr.* 15 (No. 1755)], are appended. A comparison between species is given in diagrams. *From author's summary.*

3231. KÜHNE, H. Über den Einfluss von Wassergehalt, Raumgewicht, Faserstellung und Jahrringstellung auf die Festigkeit und Verformbarkeit schweizerischen Fichten-, Tannen-, Lärchen-, Rotbuchen- und Eichenholzes. **[Effect of moisture content, density, arrangement of fibres and annual rings on the strength and deformability of Swiss-grown Spruce, Silver-Fir, Larch, Beech and Oak wood.]** *Bericht, Eidgenössische Materialprüfungs- und Versuchsanstalt für Industrie, Bauwesen und Gewerbe, Zürich* No. 183, 1955. pp. 122. 80 refs. [G.g.e.f.] P.R.

Results of a detailed investigation on mechanical properties of small clear specimens of *Picea abies*, *Abies alba*, *Larix decidua*, *Fagus sylvatica*, *Quercus robur* and *Q. sessiliflora*. The following tests were carried out: compression, tension, shear, and hardness (all of these tests $\parallel$ and $\perp$); the hardness test included the Janka test, modified Brinell test with 10-mm. and 30-mm. ball, and the Chalais-Meudon cylinder indentation test; and static and impact bending. As the tests were started in 1937, the methods used do not conform completely to the recommendations of FAO. Conventional determinations of strength and Young's modulus have been supplemented by creep measurements in order to determine a 'limit of creep.' These tests were carried out as short-duration (2-min.) strain measurements with constant load. *From author's summary.*

3232. NORÉN, B. Virkes hållfasthet vid böjning på lågkant. **[Bending strength of timber placed flat.]** *Pap. ja Puu* 38 (2), 1956 (35–52). 8 refs. [Sw.e.] [Svenska Träforskningsinstitut, Stockholm.] P.R.

The purpose of the investigation was to find primary strength data for establishing rules for sorting and selecting Swedish timber for scaffolds. Boards ($1\frac{1}{4}$ in. × 7 in.) and planks (2 in. × 6, 7, or 8 in.) of *Pinus sylvestris* and *Picea abies* were tested, and the influence of knot size and grouping was studied. Conclusions are that the specifications for strength-graded structural timber, T70 and T100, will not do without reduction of permitted size of grouped knots where the timber is to be used flat. A revision of the T timber specifications, as regards groups of knots, to include timber used either on edge or flat is recommended. Results are shown in graphs and tables, and type and size of knot permitted are shown in diagrams.

3233. SEKHAR, A. C., and SHARMA, R. S. **Variation of Izod values with temperature in timber.** *Indian For.* 82 (1), 1956 (45–8). 6 refs.

A study was made of the variation of Izod values with temperature, on standard specimens of 7 species (*Anogeissus latifolia*, *Cedrela toona*, *Pterocarpus marsupium*, *Schleichera trijuga*, *Salix* sp., *Tectona grandis*, *Zanthoxylum* sp.). The test data are tabulated, and straight-line equations suggested for each species separately. Slight increases of Izod values with increases in temperature at m.c. well above fibre-saturation point were observed, and a possible critical value between 70° and 90° C. is suggested.

3234. KUMAR, V. B. **Effect of organic acids and alcohols on impact bending strength of wood.** *Norsk*

Skogind. 9 (12), 1955 (477–82). 13 refs. [E.e.nor.] P.R.

Impact bending tests were made on samples (10–15 from each impregnation) of *Populus nigra, Fagus sylvatica, Betula verrucosa, Musanga smithii* and *Pinus sylvestris*, after soaking in water, methyl, ethyl, propyl, butyl or amyl alcohol, or formic, acetic, propionic or butyric acid. No simple correlation to include all species was found between density and impact bending strength. Pine and Birch gave lower values than their densities suggested, possibly because of their high lignin contents. Water increased the strength of Birch, Poplar and Pine, and decreased that of Beech and possibly of *M. smithii*. All the alcohols increased the strength of Poplar significantly, all except propyl alcohol that of Pine, and all except amyl alcohol that of Birch; reactions of Beech and *M. smithii* varied with the alcohols. The organic acids had a very much more varied effect, but raised the strength of most species. Swelling decreased linearly with increasing molecular weight of the liquid within a homologous series, but no relation was found between swelling and impact bending strength.

3235. YAMAI, R. **[Stress-strain curves of wood. (Report 2) Stress-strain curves for partial compression perpendicular to grain (*Schwellendruck*). (1).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (101–47). 12 refs. [Jap.jap.e.]

Continues an investigation on *Picea jezoensis* [see *For. Abstr.* 16 (No. 4521)], presenting mainly the stress/strain curves for compression $\perp$, where the load is applied through an iron plate covering part of the surface, as occurs, for instance, in railway sleepers or in the bearing surface of beams. The direction of loading in relation to the annual rings was found to affect the general type of these curves, but the dimensions of the specimens appeared to have no effect. Tabulated data are given to show the effect, for 3 different loadings (tangential, 45° and radial), of length, depth, variation of bearing surface area (including complete covering of the surface by the bearing plate) and the substitution of a wooden for the metal plate. Photos show the type of failure after about 10% compression and data are also given for recovery (at permanent set) after deformation by 10% and, for part of the material, 5% compression.

3236. SAWADA, M., TSUJI, K., and KONDO, K. **[Relation of hardness to compressive strength of wood (Report 1).]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (149–74). 10 refs. [Jap.jap.e.]

The material used for tests of hardness and of maximum crushing strength $\parallel$ consisted of $>$ 600 small, clear, air-dry specimens covering a specific gravity range of 0·27 to 0·79 in the following order: *Cryptomeria japonica* (2 provenances), *Pinus densiflora, Picea jezoensis, Fagus crenata, Quercus crispula* and *Robinia pseudoacacia*. The hardness factor, H (kg./sq. mm.), was derived from $H = \frac{P}{\pi \cdot D \cdot h}$ where P is the load in kg. required to embed a ball of 10 mm. diam. (D) to a depth of $\frac{1}{\pi}$ mm. (h). It is therefore $\frac{P}{10}$ kg./sq. mm. The rate of penetration was 0·5 mm./minute. The data are presented in tables and graphs with English legends. The following linear relations and ratios are established for the hardness of the end, tangential and radial surfaces (*Hl, Ht, Hr*), for early (*Hf*) and late (*Hs*) wood, for the specific gravity (*ru*) and the crushing strength in kg./sq. cm. (σc) : $\sigma c = \alpha.Hl$; $Hl = \beta.ru$; and $\sigma c = \gamma.ru$, where $\alpha \simeq 90 \pm 5{\cdot}3\%$, $\beta \simeq 7{\cdot}5 \pm 7{\cdot}6\%$ and $\gamma \simeq 650 \pm 7{\cdot}3\%$. The ratios of hardness are $Hl : Ht : Hr$ as 1 : 0·30 : 0·34. For the early wood of the *Cryptomeria* and Spruce these ratios ($Hlf : Htf : Hrf$) are 1 : 0·26 : 0·36. Taking the hardness of the corresponding late wood as unity, the mean values for all species, of the hardness of the early wood of the end, tangential and radial surfaces were ca. 0·62, 0·52 and 0·60 respectively.

3237. WEINBAUM, O. Ensaio de fadiga com pinho brasileiro. **[Test of fatigue in *Araucaria angustifolia*.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (170–5). [Port.]

A specimen of *A. angustifolia* of [air-dry?] density 0·52–0·57 g./c.c. and with a m.c. of ca. 12·6% was subjected to repeated bending tests. A correlation was found between the load applied and the logarithm of the number of repetitions of stress causing failure. A load of 800 kg./sq. cm. can be applied in a cycle of 1000 repetitions and a load of 400 kg. in 1,000,000 repetitions, without failure. In this respect the wood proves superior to the aluminium alloy Alclad 23 ST.

3238. WEINBAUM, O. Ensaios de torção. **[Torsion tests.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (25–32). [Port.e.]

Torsion tests were made on *Araucaria angustifolia* and Peroba Rosa [*Aspidosperma* sp.] in two forms: (1) reaction to static stress, and (2) reaction to repeated stress. (1) *A. angustifolia* specimens of sp. gr. 0·45–0·65 g./c.c. showed a resistance to static loads in torsion varying between 123 and 182 kg./sq. cm. This is less than half its resistance to static compression loads. Wood of Peroba Rosa of sp. gr. 0·70–0·85 g./c.c. showed a resistance to static loads in torsion varying between 187 and 248 kg./sq. cm. This again is less than half its resistance under static compression. (2) Applying a load of 101 kg./sq. cm., a cycle of 50,000 repetitions of stress was necessary to induce failure of *A. angustifolia*; at 63 kg./sq. cm., 3,152,000 repetitions were needed. Peroba Rosa subjected to fatigue tests in torsion required a load of 141 kg./sq. cm., applied in a cycle of 47,000 repetitions to produce failure; with a load of 85 kg./sq.cm., 10,207,000 repetitions of stress were necessary. In both cases there is a correlation between the load applied and the logarithm of the number of repetitions of stress needed to produce failure. [Cf. preceding abstract.]

3239. REID, W. H., and KOCH, C. B. **A laboratory method for testing wood mine pins in tension.** *Bull. W. Va. agric. exp. Sta.* No. 383*T*, 1955. pp. 5. 9 refs.

The support of mine roofs by means of steel bolts has been found to be practical, and in some areas, where corrosive water is a problem, wooden pins are used for this purpose. The present bulletin describes a method of testing such pins in the laboratory.

813. Wood Chemistry

See also Nos. 3185, 3270, 3380–1, 3429 *et seq.*

3240. Šarkov, V. I. O himičeskom sostave othodov lesorazrabotok. **[Chemical composition of logging waste.]** *Gidrol. lesohim. Prom.* 8 (7), 1955 (3–5). 3 refs. [Russ.]

It is estimated that the total volume of logging waste (wood, bark, dry substance of foliage) in the U.S.S.R. is 50–70 million cu.m./ year, of which $\frac{2}{3}$–$\frac{3}{4}$ is wood substance, and nearly all the remainder bark. Fundamental chemical analyses of the logging waste of *Pinus sylvestris* and *Picea abies* have been carried out in order to furnish data for its rational utilization. Tables give analytical data (water extractives, alcohol extractives, pectins, cellulose after Kürschner-Hofer, uronic acids, pentosans, lignin, ash, total OCH_3 after extraction, and OCH_3 in lignin, for the following tissues: stemwood, pith, wood of thin branches, phloem of stem and thin branches, outer bark of stem and thin branches, young and old foliage (needles). Less detailed tables are given for *Populus tremula* and *Betula pubescens*.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 2384, 2405, 3204.

3241. Wacek, A. Ligninbausteine und Ligninbruchstücke. **[Structural elements and fragments of lignin.]** *Österreichische Chemiker-Zeitung, Wien* 54 (5/6), 1953 (61–6). 23 refs. [G.g.] L.S.

A survey mostly of American, German, Scandinavian and Austrian chemical research.

3242. Adler, E., and Stenemur, B. Ligninchemische Modellstudien: Über Chinonmethide. **[Studies on lignin chemistry models: The quinonemethides.]** *Chem. Ber.* 89 (2), 1956 (291–303). 19 refs. [G.g.] P.R.

The 'quinone-methide' reaction was studied in more detail on guaiacyl-ethyl-carbinol and some of its substitution products.

3243. Richtzenhain, H., and Alfredsson, B. Über Ligninmodellsubstanzen. **[Lignin-model substances.]** *Chem. Ber.* 89 (2), 1956 (378–85). 16 refs. [G.g.] P.R.

Describes the preparation and testing of model substances from the flavan and cumaron series.

3244. Reznik, H. Über den histochemischen Nachweis der an der Verholzung beteiligten β-Glucosidasen. **[Detection by histochemical methods of the β-glucosidases participating in the process of lignification.]** *Planta* 45 (5), 1955 (455–69). 24 refs. [G.g.] O.B.D.

Reports experiments on *Araucaria excelsa, Pinus sylvestris, Pinus mugo, Picea abies, Syringa vulgaris,* and *Forsythia suspensa.*

3245. Traynard, P., and Eymery, A. Délignification des végétaux par les solutions hydrotropiques. **[Delignification of plant material with hydrotropic solutions.]** *Holzforschung, Berlin* 9 (6), 1955 (172–7). 41 refs. [F.f.g.] P.R.

By comparing the effect on Poplar wood of non-hydrotropic Na acetate solutions with that of hydrotropic Na benzoate solutions it was found that lignin was solubilized in two stages: (1) hydrolysis by water at pH ≈ 7, followed by (2) the dissolving effect of the hydrotropic solvent. *From authors' summary.*

3246. Goldschmid, O. **Aqueous hydrolysis of lignin. I. Paper chromatographic separation of monomeric lignin degradation products.** *Tappi* 38 (12), 1955 (728–32). 19 refs. P.R.

Describes a method for paper-chromatographic separation, employing both the organic and aqueous phases of Lindstedt's mixture of C_6H_6, ligroin, methanol, and water as the mobile phase. Vanillin, coniferyl aldehyde, vanilloyl methyl ketone, and *p*-coumaraldehyde have been identified.

3247. Kratzl, K., and Schweers, W. Über die papierchromatographische Trennung der monomeren Äthanolyseprodukte des Lignins. III. **[Paper-chromatographic separation of the monomer products of lignin ethanolysis. III.]** *Chem. Ber.* 89 (2), 1956 (186–92). 16 refs. [G.g.] P.R.

Describes the separation of phenyl-propane derivatives with syringyl and *p*-hydroxyphenyl grouping, and the possibility of ethanolysis of hardwood lignins and of an artificial lignin (Freudenberg's DHP lignin).

3248. Enkvist, T., Alm, B., and Holm, B. **Some experiments concerning the acidic groups of lignin.** *Pap. ja Puu* 38 (1), 1956 (1–8, 12). 43 refs. [E.e.] P.R.

The phenolic and strongly acidic groups were determined by different methods for a number of lignin preparations and model compounds. Values expressed as number of phenolic hydroxyl groups per phenyl-propane unit of lignin ranged from 0·35 to 1·04.

3249. Wacek, A. von, Limontschew, W., and Zeisler, F. Vergleichende Untersuchungen über die Haftfestigkeit von Methoxylgruppen verschiedener Ligninpräparate des Fichtenholzes. **[Comparative investigations on the bond strength of OCH_3 groups in different lignin preparations obtained from Spruce wood.]** *Chem. Ber.* 89 (2), 1956 (447–53). 15 refs. [G.g.] P.R.

3250. Ishikawa, H., and Ide, C. **[Studies on lignin. 18. The relation between phenolation and sulphonation.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (11–6). 17 refs. [Jap.e.] P.R.

By phenolating lignosulphonates, a phenolate is obtained having roughly the same properties as phenol protolignin. The character of the sulphite group in lignosulphonate and the mechanism of desulphonation are discussed.

3251. Sohn, A. W., and Munder, H. Beitrag zur Chemie der Oxystilbene der Nadelhölzer.

[Chemistry of the hydroxystilbenes of coniferous woods.] *Holzforschung, Berlin* 9 (6), 1955 (161–6). 13 refs. [G.g.e.] P.R.

It was found that Richtzenhain's hydroxystilbene is present as such neither in the sulphite liquor nor in Spruce wood, but is a product of alkali degradation, vanillin not being its intermediate product. The basic material of this hydroxystilbene is an acid substance of low molecular weight, and its concentration may be increased by fractionation; it can be partly extracted from Spruce wood with 30% acetic acid. *From authors' summary.*

3252. HIGUCHI, T., KAWAMURA, I., and MORIMOTO, I. **[Studies on lignins of tropical dicotyledonous woods. III. Ethanolysis of wood meal.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (35–7). 4 refs. [Jap.e.] P.R.

Compounds isolated from aqueous solution and ethanol-lignin obtained after the ethanolysis of wood meal of 7 species of tropical dicotyledons lead to the suggestion that their lignin has a constitution similar to that of the temperate-zone dicotyledons.

3253. KRATZL, K., and SILBERNAGEL, H. Über das Verhalten von Faserplatten und vergüteten Vollhölzern sowie technischer Säurelignine bei Oxydation mit Nitrobenzol und Alkali vor und nach thermischer Behandlung mit Wasser. **[Behaviour of fibreboards, improved solid wood and industrial acid lignins, when oxidized by nitrobenzene and alkali before and after heat treatment in water.]** *Mitt. öst. Ges. Holzforsch.* 8 (1), 1956 (9–12). 9 refs. [G.g.] P.R.

[Cf. *For. Abstr.* 17 (No. 1994).] The lignin in industrial fibreboards (Asplund, Nowak) and in improved woods (Staypak, Thermodyn) displayed almost the same chemical behaviour as lignin in solid wood; heating with water produced in both kinds of lignin a similar fall in the yield of phenolaldehydes on decomposition. Conditions in which industrial acid lignin (Bergius-Rheinau and Scholler-Tornesch processes) is produced were found to have an important effect on its chemical properties.

3254. TRECCANI, P. T., and TENTORIO, G. Metodi di analisi per la determinazione separata dell' amido, di altri polisaccaridi e degli zuccheri solubili nei tessuti legnosi. **[Methods of analysis for the separate determination of starch, the other polysaccharides, and the soluble sugars in woody tissues.]** *Ann. Sper. agr.* 9 (6), 1955 (xxviii–xxxiv). 10 refs. [It.e.] C.G.B.

3255. MELLER, A. **The question of the existence of weak links in the cellulose molecule.** *Holzforschung, Berlin* 9 (5), 1955 (149–53). 30 refs. [E.e.g.] P.R.

A discussion of the question, with particular reference to two hypotheses, that of Pacsu and coworkers, and that of Schulz and Husemann. [Cf. *For. Abstr.* 17 (No. 1978).]

3256. DOLMETSCH, H. **Structure of weak links in the fibrillar system of native cellulose fibres.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2725, 1955. pp. 13 + 10 photos + 8 dgms. 23 refs. Transl. by M. Slade from *Holz Roh- u. Werkstoff* 13 (3), 1955 (85–91). [Cf. *For. Abstr.* 17 (No. 1978).] Limited distribution.

3257. SNYDER, J. L., and TIMELL, T. E. **Molecular properties of native Balsam Fir cellulose.** *Svensk PappTidn.* 58 (23), 1955 (851–9). 47 refs. [E.e.sw.] P.R. [McGill University, Montreal.]

Cf. *For. Abstr.* 16 (No. 3396).

3258. SNYDER, J. L., and TIMELL, T. E. **Some chemical properties of Balsam Fir cellulose.** *Svensk PappTidn.* 58 (24), 1955 (889–93). 24 refs. [E.e.sw.] P.R.

3259. TIMELL, T. E. **Molecular weight and polymolecularity of White Birch [*Betula papyrifera*] celluloses.** *Svensk PappTidn.* 59 (1), 1956 (1–11). 42 refs. [E.e.sw.] [McGill University, Montreal.] P.R.

[Cf. *For. Abstr.* 13 (No. 3339)]. The present investigation was of similar scope but included several improvements in technique and gave somewhat different results.

3260. HÄGGLUND, E., RICHTZENHAIN, H., and DRYSELIUS, E. Über ein methoxylhaltiges Kohlenhydrat im Fichtenholz. **[A methoxyl-containing carbohydrate in Spruce wood.]** *Chem. Ber.* 89 (2), 1956 (375–8). 8 refs. [G.g.] P.R.

Up to 6·5% of such carbohydrates were isolated by chromatography from products of acid hydrolysis of *Picea abies* wood or holocellulose. They might be non-purified aldobionic acids.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 3181, 3254.

3261. MODICA, G. DI, and ROSSI, P. F. Su sostanze estratte dal durame di '*Cupressus sempervirens* L'. **[Heartwood extractives of *C. sempervirens*.]** *Annali di Chimica, Roma* 45 (4/5), 1955 (354–7). 10 refs. [It.it.] [Turin University.] L.S.

Analysis of the ether extractives of *C. sempervirens* showed that carvacrol was the most important constituent. [Cf. *For. Abstr.* 14 (No. 1533).]

3262. ERDTMAN, H., and PELCHOWICZ, Z. Die Chemie der Ordnung Cupressales, XII. Mitteil.: Inhaltsstoffe des Kernholzes von *Biota orientalis* Endl. **[Chemistry of the order Cupressales. XII. Heartwood constituents of *Thuja orientalis*.]** *Chem. Ber.* 89 (2), 1956 (341–3). 8 refs. [G.g.] P.R.

[Cf. *For. Abstr.* 16 (No. 2203).] The following compounds were isolated: aromadendrin, taxifolin, widdrene, and cedrol.

3263. ERDTMAN, H., and PELCHOWICZ, Z. **The chemistry of the natural order Cupressales. XV. Heartwood constituents of *Austrocedrus chilensis* (D. Don), Florin et Boutelje (= *Libocedrus chilensis* (D. Don) Endl.).** *Acta chem. scand.* 9 (10), 1955 (1728–9). 5 refs. [E.] [Kungl. Tekniska Högskolan, Stockholm.] O.R.S.

Taxifolin and β-thujaplicin (in an unexpectedly high yield, i.e. > 2%) were isolated.

3264. ZAVARIN, E., and ANDERSON, A. B. Extrahierbare Bestandteile des Kernholzes der Kalifornischen Flusszeder (Incense Cedar, *Libocedrus decurrens* Torrey) IV. Vorkommen und Chromatographie von Thujaplicinen. **[Heartwood extractives of *L. decurrens*. IV. Occurrence and chromatography of the thujaplicins.]** *Chem. Ber.* 89 (2), 1956 (545–9). 13 refs. [G.g.] P.R.

Cf. *For. Abstr.* 17 (No. 1984).

3265. KONDO, T., and ITO, H. **[Wood extractives (Part I). On the heartwood of *Pinus parviflora* S. et Z.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (73–8). 13 refs. [Jap.e.]

Describes the identification of the phenolic constituents by paper partition chromatography and the isolation of extractives, among them pinitol, chrysin, strobobanksin, strobopinin and pinosylvin monomethylether.

3266. KONDO, T., ITO, H., and TOMOZO, M. **[Wood extractives (Part II). On the heartwood of *Pinus koraiensis* S. et Z.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 78, 1955 (79–83). 6 refs. [Jap.e.]

Among the extractives were pinitol, chrysin, pinocembrin, pinosylvin, and pinosylvin monomethylether.

3267. PAUL, B. H. **Resin distribution in second-growth Ponderosa Pine.** *Rep. U.S. For. Prod. Lab., Madison* No. 2046, 1955. pp. 4 + 1 gph. P.R.

Visibly resin-soaked samples of second-growth *Pinus ponderosa* were found to give unreliable density values. Great variability in resin content was found even in pieces from the outer sapwood. The average resin content for all heights of the 18 trees tested was 5·6% for trees from well stocked stands, 5·5% for medium stocking and 9·1% for sparse stocking. It is recommended that resin should be extracted before determining the density of resinous species.

3268. FARMER, R. H., and LAIDLAW, R. A. **Wood saponins. Part II. Further studies on the saponins from Morabukea [*Mora gonggrijpii* (Kleinh.) Sandwith].** *J. chem. Soc.* Dec., 1955 (4201–5). [Forest Products Research Laboratory, Princes Risborough.] O.R.S.

Results obtained from examination of a saponin with a very low galactose content are presented, discussed and compared with previous findings [cf. *For. Abstr.* 15 (No. 4108)].

813.3. Ash Constituents

See Nos. 2540, 2543.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

See Nos. 3380–1.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See also No. 3253.

3269. ROSS, J. D. **Chemical resistance of Western woods.** *For. Prod. J.* 6 (1), 1956 (34–7). 6 refs.

Thirteen Western and 2 Southern [U.S.] woods were exposed to solutions of several common acids, bases, and salts at room and boiling temperature. The extent of deterioration was determined by comparing final mean breaking load for each species with that for untreated wood. *From author's summary.*

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 3181, 3185, 3216, 3400–1.

3270. KOHARA, J. **[Studies on the durability of wood. XV. The effect of age on the components of the wood of *Zelkova serrata* Makino.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (21–4). 4 refs. [Jap.e.] P.R.

Specimens of *Z. serrata* 240–650 years old, by comparison with wood of recent date, show that: the proportion of lignin, water extracts, alcohol extracts and 1%-NaOH extracts significantly increases, that of cellulose and α-cellulose significantly decreases, and that of pentosans remains constant, as the age increases. Owing to the rate of change being greater in *Z. serrata* than in *Chamaecyparis obtusa* [cf. *For. Abstr.* 16 (No. 4541)], the mechanical durability of the former over centuries is much inferior.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 3185, 3201–7, 3212, 3214, 3226–9, 3401, 3424–5.

3271. **[Spiral grain of *Araucaria cunninghamii*.]** *Rep. Dir. For. Qd. 1954/55*, 1955 (24).

Observations were made on 25 select high-pruned stems from a 'plus' stand of Hoop Pine, that had been removed in a thinning designed to encourage seed production for élite trees. They were representative of the better-quality stems of the stand and ranged from 17·2 to 35·3 in. in g.b.h. All stems exhibited some degree of spiral grain, mostly quite slight. Spirality increases with increasing height and decreases with increasing diameter, and thus seems to form a core of spiral grain. The maximum spirality observed was 1 in. departure in 6 in. length. Owing to the nature of the bark of Hoop Pine, no external indications of spiral grain can be observed.

3272. ***P[inus] elliottii* var. *elliottii*—development of compression wood.** *Rep. Dir. For. Qd. 1954/55*, 1955 (24 + 2 photos).

During the cyclone of Feb. 1954 many stems in plantations of this species were blown from the vertical to various degrees of lean. Opportunity was taken to set up a series of field observations, and examination of two of the trees showed that by July 1954 a distinct band of compression wood had appeared on the under-side of the stem. Observations at regular intervals also indicated that the whole tree axis was moving back towards the vertical. At July 1954 the height of one tree was 25 ft. and it had a 12½% lean. A plumb-bob was suspended from a point 15 ft. high; by June 1955 it had moved 22·8 in. nearer to the tree.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

See also No. 2838.

3273. BERŠADSKIĬ, A. L. O davlenijah, deĭstvujuščih na rezec pri obrabotke drevesiny. [**Forces acting on cutting tools during woodworking.**] *Derev. Prom.* 4 (4), 1955 (7–9). [Russ.] P.O.

Some authors wrongly believe that the deformations observed in cutting tools are caused by compression stresses generated in the wood during the woodworking process. The author analyses the available data regarding the compression of a test-piece held in a press and one constricted on all sides. The phenomena taking place during these two processes are completely different. When, in practice, the cutting edge penetrates the wood, the latter is compressed in a semi-enclosed space. The degree of compression in the portion adjacent to the cutting edge depends on the resistance of the wood above, in front of, and below the edge. X-ray photographs show that the volume of the chip removed is compressed to 50–66% of normal. It appears, therefore, that the pressures near the edge are much higher than the resistance of the wood to failure by compression. Vagin determined the mean pressure to be 32 kg./sq.mm. when the length of the edge was 1 mm. and the radius of blunting $p = 0{\cdot}015$–$0{\cdot}25$ mm. His method consisted in using a working-piece, first sliced into lamellae 0·1 mm. thick and then re-assembled and mounted to form a reconstituted [virtually 'free'] working-piece. It can be assumed that, at the front edge of the blade, pressures of ca. 100–150 kg./sq. mm. are likely to develop.

3274. ENDERSBY, H. J. **The blunting of wood-cutting edges.** *Spec. Rep. For. Prod. Res., Lond.* No. 11, 1956. pp. 15 + 8 plates. Price 2*s*.

A description is given of the preparation of good-quality cutting edges on high-speed steel cutters and on tools tipped with hard metal. High-speed steel cutters were employed to determine the effect of the sharpness angle on the power required in cutting and on the blunting of the edge. The effect of cutting angle on edge wear was also studied. The behaviour of edges formed in tungsten carbide and a cobalt/chrome/tungsten alloy was observed and their performance compared with that of high-speed steel cutters. *Author's summary.*

821. Barking

See also Nos. 2860–1, 3360.

3275. BURCHILL, J. G. **The Andersson barker.** *Timber of Canada* 16 (4), 1955 (19–22, 33–6).

Covers description, operation, efficiency, maintenance and operating costs. [Cf. *For. Abstr.* 13 (No. 4235).]

3276. THOMPSON, C. A. (to International Paper Co.). **Log-barking drum and toothed element therefor.** *U.S. Patent* No. 2,712,330, July 5, 1955. pp. 2 + 15 dgms. 5 refs.

A number of sets of toothed elements are fixed along the entire interior of the drum, thus increasing the barking efficiency for softwoods and enabling hardwoods to be completely barked. The spacing between the sets is less than the lengths of the pulpwood billets to be barked.

3277. CRANK, E. D. **Rotary barking machine.** *U.S. Patent* No. 2,712,329, July 5, 1955. pp. 4 + 8 dgms. 8 refs. P.O.

The barker accommodates logs of various sizes; it contains a wheeled carriage on which the barking head is mounted so as to compensate for the crookedness or twisting of logs. The head contains a sleeve with many sets of steel-cable brushes for scraping and removing all bark in one operation.

3278. **Practical slab debarker.** *Sth. Lumberm.* 192 (2397), 1956 (38).

The principle used is that of a high-speed rotating cylinder to which are attached multiple rows of specially designed chains. These are attached to steel plates that are cut out on a radius roughly that of the log from which the slabs were cut. The material is fed lengthwise under the cylinder (which can be raised or lowered, according to the thickness of the material) by power-driven feed rolls at adjustable speeds. Two models are being made. The larger, with 2 cylinders and 3 electric motors, is designed for a capacity of 2–3 cords/hour.

822. Saws and Sawing

See also Nos. 3311, 3313–14, 3347.

3279. HYLER, J. E. **Modern sawmilling, Parts 35 to 41.** *Sth. Lumberm.* 191 (2393), 1955 (227 . . . 230); 192 (2394–2399), 1956 (45 . . . 52; 45 . . . 49; 43 . . . 46; 49 . . . 52; 33, 35; 43–6).

Chiefly saws, band and circular, and their maintenance.

3280. SAITO, Y., and MORI, M. [**Studies on the strain of bandsaws.**] *Wood Ind., Tokyo* 10 (4), 1955 (166–74). 10 refs. [Jap.e.] P.R.

Gives formulae for calculating the relation of strain to weight on the lever, and the safety factor.

3281. SUGIHARA, H., and SUMIYA, K. **A theoretical study on temperature distribution of [a] circular saw-blade.** *Wood Res., Kyoto* No. 15, 1955 (60–74). 5 refs. [E.jap.]

Presents in graphs results from theoretical calculations and earlier experiments [see *For. Abstr.* 16 (No. 962)]. Practical issues are not discussed. Further work is desirable.

3282. AZZOLA, F. K. Beziehungen zwischen Zahnform, Vorschubgeschwindigkeit und spezifischer Zerspanungsarbeit beim Kreissägenlängsschnitt. [**Relationships between tooth shape, feed rate and specific work of chip formation in circular ripsaws.**] *Holz-Zbl.* 80 (108), 1954 (1266). 5 refs. [G.g.]

Five graphs show the relationship between the specific work done in cutting (in KWH/c.c. of chip volume) and feed rate (up to 48 m./min.) when stored coniferous wood was ripsawn with 5 different sawblades. For one of these it was found that side dressing always reduced the amount of specific work. Analysis of the results enables the most

advantageous tooth shape to be found for each of the 3 feed-rate ranges (0–20, 20–40, and > 40 m./min.).

3283. **The study of sawing problems by the 'Centre Technique du Bois', Paris.** *For. Equipm. Note FAO* No. *D.* 6.55, 1955. pp. 2.

Notes on two types of sawtooth design—the adaptation of the 'Duo-Kerf', and the Perroquet tooth design (an improved gullet tooth in which all the straight parts have been changed to curved).

3284. LUNDBERG, A. E. **Improvement in saw blades.** *Brit. Patent* No. 673,259, June 4, 1952. pp. 3 + 7 dgms. P.R.

A saw blade with spring-set teeth, in which the tops of the teeth, when viewed in cross-section through the blade, are inclined outwards at an angle of 25–50° to a line drawn at right angles to the plane of the blade, the angle between the top of the tooth and the side of the blade being > 90° (preferably even > 105°).

3285. Internationale Normung der Sägeblätter und Handsägen. **[International standardization of saw blades and hand saws.]** *Holz-Zbl.* 81 (64), 1955 (780–1). [G.]

Summarizes decisions and recommendations of the meeting of the Committee on Tools of the International Organization for Standardization (Paris, March, 1955). The designation of tooth shape has been taken over from Austrian standards already adopted by FAO. Conventions for identification of different types of saws (circular, frame, band, hand) were developed. Some tooth shapes are recommended for circular and band saws.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

3286. KIRSTEN, P. Vorschub-Gliederwalzen. **[Sectional feeder rolls [for planing machines].]** *Holz-Zbl.* 82 (10), 1956 (103–4). [G.g.]

Describes and illustrates such rolls and their working, including a novel construction using a driving axle *outside* the feeder rolls, from which motion is transmitted individually by cog-wheels to each section of the roll. It is claimed that this construction makes it possible to machine simultaneously pieces of varying thickness at a constant feeder speed, pressure varying automatically with works resistance.

3287. Es. Die Doppelendbearbeitung mit neuzeitlichen Maschinen. **[Modern machinery for combined cutting actions.]** *Holz-Zbl.* 82 (19/20), 1956 (235–6). [G.]

Describes modern machinery, some of it fully automatic, for profiling, mortising, tenoning, boring etc. in furniture manufacture.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

See Nos. 3338–40, 3346.

824.8. Glues and Gluing

See also Nos. 3299, 3327–9, 3331.

3288. **List of publications on glue, glued products, and veneer.** *Rep. U.S. For. Prod. Lab., Madison* No. 513, 1956. pp. 22. P.R.

Covers the results of research by Madison since ca. 1922 on the development of waterproof glues, preparation and application of various glues, plywood manufacturing problems etc.

3289. KNIGHT, R. A. G. **The efficiency of adhesives. Summary 1.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 21. Limited distribution. P.R.

Brief accounts of 9 major experiments for which at least 1 progress report has been prepared. The summaries are intended to be published once a year so as to be cumulative and at the same time complete in themselves. A uniform system of recording has been followed, and précis of results are added. The summary ends with a general assessment of durability for the principal glues used in the tests.

3290. KUENZI, E. W. **Determination of mechanical properties of adhesives for use in the design of bonded joints.** *Rep. U.S. For. Prod. Lab., Madison* No. 1851, 1956. pp. 13 + 2 photos. P.R.

Published in cooperation with the ANC-23 Panel on Sandwich Construction of the Departments of the Air Force, Navy, and Commerce, this report describes test methods for determining the basic mechanical properties of adhesives subjected to shear or tension in bonds between relatively rigid members.

3291. MARRA, A. A. **A new method for testing wood adhesives. II. Test apparatus.** *For. Prod. J.* 5 (6), 1955 (385–8).

[For Pt. I. see *For. Abstr.* 17 (No. 2033).] Illustrated description of a specially designed, simple machine and the test procedure, for use in both factory and laboratory.

3292. **Plywood glue shear test.** *Veneers & Plyw.* 48 (9), 1954 (24). P.R.

Describes the conduct of this test (dry and wet) using the beam-type instrument, and gives the generally accepted standard values for different glues.

3293. SORSA, B. Sahatavaroista liimatun kulmaliitoksen kestävyys. **[Durability of cross-glued timber joints.]** *Tied. Valt. tekn. Tutkimusl.* No. 139 1955. pp. 31. [Fi.e.] P.R.

Test specimens (illustrated), glued with different glues and consisting of two pieces face to face with a third between them at grain angles ranging from 15 to 60°, were kept for 2½ years out of doors under cover, i.e. sheltered from sun and rain but exposed to changes in moisture content. They were then exposed indoors to alternate monthly spells of damping and drying, for a year. Results of tests on the joints are given in tables with some English legends. Similar, usually good, results were obtained from pieces glued with resorcinol-formaldehyde or casein, and much poorer results from those glued with urea-formaldehyde; the formula

used for the last named was, however, not one of the best. Dimensions of timber and battens used were 2 × 6 in., 1 × 6 in., ¾ × 5 in., and ½ × 4 in. Durability of specimens constructed from 2 × 6 in. timber was low for all angles of the intercalated piece, and such should not be used. Battens 1 × 6 in. or less and bonded with the better glues made durable joints at an angle of 15° and gave relatively satisfactory results with one of 30°. Photographs are given of the outer pieces of the specimens, showing the amount to which the joints had opened during the test. *From author's summary.*

3294. **Durability of RF bonded urea resin joints.** *B.C. Lumberm.* 40 (1), 1956 (53).

Comparisons of edge-glued Yellow Birch joints (6% m.c.), cured for 15, 30, 60 and 120 seconds and made by cold clamping, hot pressing (212° F.) and dielectric heating and subjected to accelerated and natural ageing tests, showed no significant difference after 5 years between the dielectrically heated and hot-pressed joints. Cold clamping was slightly better than the heating methods.

3295. ELMENDORF, A. **Tests on polyvinyl resin adhesives and their application in the woodworking industry.** Swift and Co. [U.S.A.] 1955. pp. 34. P.R.

The cleavage test in glued furniture seems to come closer to simulating service conditions than pure shear stresses. Pressures obtained with hand clamps are adequate to obtain full bond strength. Satisfactory joints are obtained with a 50 lb./1000 sq. ft. glue spread, with pressures from 25 to 100 lb./sq. in., the closed assembly time not exceeding 6 min. The joint was not weakened by exposing it to 120° F. or raising the moisture content of the wood at room temperature; nor did ageing up to 16 months affect the bond strength. The glue line should be < 0·005 in. thick.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

3296. FLEISCHER, H. O. **Instruments for alining the knife and nosebar on the veneer lathe and slicer.** *For. Prod. J.* 6 (1), 1956 (1–5).

Describes instruments developed for accurate measurement of the knife angle and the knife-edge/nosebar-edge alignment.

828. General Carpentry and Joinery

3297. **Quality of timber and workmanship in joinery. Part 2: Quality of workmanship.** *Brit. Stand.* No. 1186 (Part 2), 1955. pp. 13. Price 2*s.* 6*d.* P.R.

829.1. Finishing

3298. **[Modern wood finishing.]** *Wood Ind., Tokyo* 11 (1), 1956 (1–46). [Jap.] P.R.

Eighteen articles [in Japanese but with English titles] on various aspects of finishing.

3299. PEDANOV, F. Ispravlenie porokov drevesiny posredstvom kleja VIAMB-3. **[Correction of timber defects by means of the VIAMB-3 glue.]** *Morskoĭ Flot* 15 (4), 1955 (29). [Russ.] From *abstr.* in *Prehl. lesn. lit.* 6 (9), 1955 (No. 3682). [Cz.] P.R.

Presents the results of tests of glue for the plugging of knot-holes and filling admissible checks. After polymerization of the glue (24 hours), the test-pieces were thrice immersed for 72 hours in water and dried after each immersion to 16–18% m.c. The glue-line showed no defect.

3300. BROEKER, J. F. **Development of exterior coatings for wood.** *Paint Industry Magazine, Philadelphia* 70 (7), 1955 (9–12). P.O.

A review of the work of the E.I. du Pont de Nemours and Co. organization during the past 23 years in the field of paints for wood.

3301. DANTUMA, R. S. **The inhibiting effect of various paint systems on the moisture absorption of wooden test panels.** *Technical Translation, National Research Council of Canada, Ottawa* No. *TT*-557, 1955. pp. 42. Transl. by H. A. G. Nathan from *Verfkroniek, Amsterdam* 27 (6; 7), 1954 (144–7; 173–7). P.R.

The results of a number of experiments were inconclusive; e.g. in specimens exposed to weathering for 1 year, the water content differed greatly and was unpredictable.

3302. WORKS, W. R. **Plastic overlays for wood products.** *For. Prod. J.* 6 (1), 1956 (18*A*–20*A*). 3 refs.

Reports recent progress in the field of plastic-impregnated paper overlays and indicates the probable direction of future development.

3303. HEEBINK, B. G. **Paper-overlaid planks provide smooth, durable stadium seats.** *Sth. Lumberm.* 191 (2393), 1955 (125–6). [Forest Products Laboratory, Madison.]

The seats, made from random widths of low-grade lumber, were overlaid with 4 layers of kraft paper impregnated with a water-soluble phenolic resin, glued to each other and to the plank with an acid-catalysed phenol adhesive. After two seasons' use, and exposure to all weathers, they were in almost perfect condition except for some surface fading, whereas Redwood and Douglas Fir planks used as controls had developed end checks. [Cf. *For. Abstr.* 16 (No. 1107).]

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See Nos. 2856, 3239, 3315–6, 3371–5, 3405, 3458.

832. Mills, Their Functions and Products

832.1. Sawmills and Planing Mills

See also Nos. 2838, 3279–87, 3347–8, 3548.

3304. **The timber industry: A.T.P. [African Timber and Plywood Ltd.] at Sapele.** *Nigeria Trade Journal, Lagos* 4 (1), 1956 (6–13).

Describes with illustrations the work in logging, sawmilling, and plywood manufacture of this subsidiary of the United Africa Company, which has

invested £2½ million in the Nigerian Timber Industry. The plywood factory's basic cost was £500,000. It is claimed to be the most up-to-date and highly mechanized in the world. Species used are listed.

3305. **Red Gum saw milling.** *Aust. Timb. J.* 21 (11), 1955 (1030 . . . 1039, 1105).

An illustrated account with acreages, yield, occurrence, site conditions, and methods of working, felling, transport and sawmilling of *Eucalyptus camaldulensis* (*E. rostrata*), in the Murray River drainage. Works undertaken to maintain the level of flooding, now interfered with by barrages, and illustrations of extraction by barge and raft, now replaced by lorry hauling, are included.

3306. FRONIUS, K., and ASCHENBRENNER, F. X. Aus der skandinavischen Sägeindustrie. **[On the sawmilling industry of Sweden and North Finland.]** *Holz-Zbl.* 82 (29), 1956 (379–80). [G.]

An illustrated account of a study tour to timberyards and sawmills (e.g. the giant works at Kemi) describing their lay-out, equipment and working methods, e.g. a highly sensitive metal detector, consisting of a concrete ring, suitably wired to produce an electromagnetic field, through which logs pass, usually on their way from storage to sorting pond, but which can also be adapted for use on land [cf. *For. Abstr.* 15 (No. 3035)]. A method of making packing-case parts uses boards from small wood and slabs. Artificially dried and cut into suitable lengths, these are tongued-and-grooved along their long sides, and complementary pieces are fitted and glued together into slab boarding. This is then sliced to the required thickness.

3307. **Self-propelled sawmill.** *For. Equipm. Note FAO* No. *D*.7.55, 1955. pp. 1.

Photograph and short description of the Link Mobile Sawmill, manufactured by Link Mobile Sawmill Equipment, Star City, Indiana.

3308. **Small sawmill review.** *Lumberm.* 83 (1; 2), 1956 (65–77, 104 . . . 111; 80 . . . 100, 104, 116).

Describes methods and equipment used at individual mills, and lists U.S. and Canadian manufacturers supplying equipment suitable for small mills. Includes a paper on the use and recovery of young Douglas Fir in small mills (*E. E. Matson*).

3309. JURET, P. Choix du matériel électrique en scierie. **[Electrical equipment for sawmills.]** *Rev. int. Bois* 23 (214), 1956 (54–6). [F.]

Notes on electric motors, transformers, condensers etc., and peculiar problems of installation.

3310. FRONIUS, H. Der Leistungslohn am Vollgatter. **[Piece rates in frame-sawing.]** *Holz-Zbl.* 82 (35), 1956 (455–7). [G.]

Discusses, with examples, the factors affecting output in cu.m., i.e. log diameter, saw speed, and, as a resultant, feed speed, and gives a formula for computing normal output/hour and payment for work exceeding the norm.

3311. BELL, G. E., and CALVERT, W. W. **Sawing hardwoods for grade with short-log bolters.** *For. Prod. J.* 5 (6), 1955 (396–400). 9 refs.

Comparative sawings of similar material by a bolter and by a conventional circular sawmill show that a short-log bolter can be used most effectively as a complementary unit.

3312. KING, W. W. **Log diameter—key to high profits.** *Sth. Lumberm.* 192 (2395), 1956 (38, 40).

Contains a table, based on the examination of over 5000 hardwood logs from 58 small sawmills, showing, for 9 species, the average % of No. 1 Common or Better Grade lumber yielded by each diameter class from 8 to 27 in. small-end diam. u.b. irrespective of log grade.

3313. KNEŽEVIĆ, M. Maksimalno kvantitativno iskorišćenje dopunske zone španunga. **[The maximum quantitative utilization of slabs produced in frame-sawing.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (75–93). [Serb.serb.e.]

In a mathematical approach to the problem, the author selects the cone as the most appropriate shape, shows that the highest utilization % is obtained when the board sawn from the tapering part is half as long as the whole log, and evolves a method of calculating the width and thickness of this board for different log lengths, diameters and tapers. Special tables give the optimum thickness of boards of different widths, obtained from the part involved. The author suggests sawing the offcut from the log in one piece, and breaking it up into thinner assortments on special sawing machines, a method said to increase utilization by at least 1%.

3314. KNEŽEVIĆ, M. Najbolje kvantitativno iskorišćenje trupaca pri rezanju jednakih debljina dasaka. **[Optimum quantitative yield per log in sawing boards of equal thickness.]** *Glasn. šum. Fak., Beograd* No. 8, 1954 (43–63). [Serb.e.]

A mathematical approach with suggestions for practical application, including a table showing the optimum thickness for each log diameter. [Cf. *For. Abstr.* 15 (No. 1813).]

3315. BENIĆ, R. Ekonomičnost kod izrade željeznickih pragova. **[Economic aspects of the manufacture of railway sleepers.]** *Drvna Ind.* 7 (1), 1956 (2–16). 8 refs. [Croat.e.] P.R.

Quotes Jugoslav standards JUS D.B4.026 (sleeper logs) and JUS. D.D1. 020 (sleepers), and gives tables for the economic utilization of roundwood in manufacture of hewn Beech and Oak sleepers. The standard relating to sleeper logs is criticized and certain changes suggested.

3316. GRANVIK, B.-A., and LEVANTO, S. Tutkimuksia eräiden ratapölkkylajien sahauksesta keuttasirkkelisahalla. **[Investigation into field-sawing certain types of sleeper with a circular saw.]** *Julkaisu, Työtehoseura, Helsinki* No. 66, 1952. pp. 95. [Fi.e.]

A study on yield and waste and on time spent in preparing sleepers of British and Polish types from 835 Pine logs. Graphs and tables have English legends.

3317. EGUND, K. F. Små bøgekævlers indhold af stavtræ, prima gulvtræ og sekunda gulvtræ. **[The content of [cooperage?] stave wood and of first- and**

second-quality flooring wood in small Beech logs.] *Træindustrien* 6 (2), 1956 (19–20). [Dan.] P.R.

Results for three sawmills are given in tables and graphs.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 2524, 3123, 3165–6, 3223, 3288 *et seq.*, 3296, 3304, 3334–40, 3345, 3349, 3362, 3548.

3318. **Twenty-fifth annual plywood review.** *Timberman* 57 (3), 1956 (66 . . . 223).

A series of articles covering developments in plywood uses, manufacture, and marketing, with a directory of manufacturers in the U.S.A. and Canada.

3319. **Trials of timbers for plywood manufacture. Progress report 29—July, 1955. Consignment Nos. 766, 796, 838. Scots Pine, *Pinus sylvestris* L., homegrown. Consignment No. 823. Douglas Fir, *Pseudotsuga taxifolia*, homegrown.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 24. Limited distribution. P.R.

3320. **Trials of timbers for plywood manufacture. Progress report 30—October, 1955. Consignment No. 844. Muhuhu, *Brachylaena hutchinsii*, Tanganyika.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 5. Limited distribution. P.R.

3321. **Trials of timbers for plywood manufacture. Progress report 31—October, 1955. Consignment No. 841. Red Meranti, *Shorea parvifolia*, British North Borneo.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 7. Limited distribution. P.R.

3322. **Trials of timbers for plywood manufacture. Progress report 32—October, 1955. Consignment No. 849. Pillarwood, *Cassipourea elliottii*, Tanganyika.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 7. Limited distribution. P.R.

3323. **Trials of timbers for plywood manufacture. Progress report 33—November, 1955. Consignment No. 856. Ceiba, *Ceiba pentandra*, Gold Coast.** Forest Products Research Laboratory, Princes Risborough. 1955. pp. 12. Limited distribution. P.R.

3324. GOTTSTEIN, J. W. **C.S.I.R.O. screen dryer for veneers.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 215, 1956 (6–8).

Describes, with constructional details and costs, a new compartment-type cross-circulation drier designed by the Forest Products Division, incorporating an experimentally developed screen and straightener. The screen is constructed of strips $1\frac{1}{4}$ in. square set at $\frac{5}{8}$-in. spacing on either side of vertical studs. Its function is to equalize air temperature, humidity, and flow through the vertical veneer sheets. One such screen is placed on either side of the drying space (for fan reversal). Shorter drying times with considerable reduction of cost are achieved without degrade.

3325. STERLIN, D. M. K voprosu polučenija ravnomernoĭ vlažnosti špona. **[Problem of obtaining veneer of uniform moisture content.]** *Derev. Prom.* 4 (5), 1955 (11–5). [Russ.russ.] P.O.

To obtain minimum variations of moisture content (m.c.) in seasoned veneer, the drying units should have temperature differences (both on different levels and within one platen) $\geq$ 5–6° C., the variation in the degree of contact between platens and veneer not exceeding 5–6%, and the variations of initial m.c. of the veneer batch $\geq$ 25–30%. Reduction of m.c. variations by ca. 50% is obtained by keeping the veneer in tight piles for 3–4 days; alternatively, veneer can be conditioned in special chambers which are described.

3326. WILLIS, E. H. **Veneer drying methods.** *U.S. Patent* No. 2,706,342, April 19, 1955. pp. 3. 15 refs. P.O.

To obtain a dry veneer free from surface cracks and checks, green veneer is dried at an elevated temperature and in the presence of a small quantity of an oil immiscible with, and less volatile than, water (mineral oil, linseed oil, castor oil, soya-bean oil, olive oil, cottonseed oil).

3327. CARRUTHERS, J. F. S. **The furrowing of veneered blockboard.** *Wood* 21 (2), 1956 (48–50). [Forest Products Research Laboratory, Princes Risborough.]

Furrowing (along the core joints) is a result of moisture changes. If the core slats are not glued this is less likely to occur if the core slats are quarter-sawn and dried to $< 12\%$ m.c., if they are tightly butted, if a veneer 0·125 in. or more thick is used, or if the boards are not bonded with excessively high pressure or temperature $> 95°$ C. If core slats are glued, furrowing is less likely and greater latitude can be given in m.c. and construction factors. *From author's summary.*

3328. HYLER, J. E. **Glue and gluing. Parts 74 to 80.** *Sth. Lumberm.* 191 (2393), 1955 (247 . . . 250); 192 (2394–2399), 1956 (63–4; 55 . . 58; 63–4; 69 . . . 72; 53 . . . 56; 63 . . . 66).

Chiefly special cores and sandwich boards.

3329. NITTA, A., and TSUNETA, M. **Laminated sheets from wood and metal.** *Japanese Patent* No. 5647 ('54), Sept. 6, 1954. [Jap.] From *abstr.* in *Chem. Abstr.* 49 (20), 1955 (14325). P.R.

Both sides of aluminium plates are coated with cotton cloth impregnated with vinyl-type adhesive (20 g./sq. ft.). The plates are next pressed for 5 min. at 15 kg./sq. cm. and 120° C., cooled to 60°, and the pressure then released. Finally wooden sheets are joined to the coated plates, using a low-temperature-hardening phenolic resin.

3330. NORRIS, C. B. **Compressive buckling design curves for sandwich panels with isotropic facings and orthotropic cores.** *Rep. U.S. For. Prod. Lab., Madison* No. 1854, 1956. pp. 5 + 12 gphs. 3 refs. P.R.

Mathematical. Published in cooperation with the ANC-23 Panel on Sandwich Construction of the Departments of the Air Force, Navy and Commerce.

3331. SHELTON, F. J. **Hot press gluing of hardboards to Douglas Fir veneers with phenolic resin adhesives.** *For. Prod. J.* 5 (6), 1955 (388–95). 7 refs.

Bond quality was determined by shear tests and by a knifing technique. It is shown that shorter pressing time may be used in bonding some hardboard face and back, Douglas-Fir centre and crossband constructions than is required for the equivalent all-Fir constructions.

3332. D., W. Untersuchung von Verwerfungserscheinungen bei Dekorplatten. **[Warping of decorative boards.]** *Holz-Zbl.* 82 (32), 1956 (416). [G.]

The boards, consisting of a layer of hardboard and several layers of paper impregnated with synthetic resin, were bonded to a piece of Limba 5-ply with different adhesives and in varying moisture relations, and warping behaviour studied over 9 weeks. PVAC (white synthetic resin) and a board m.c. of 2–3% less than the plywood base are among the recommended treatments.

832.4. Wooden-House Factories. Prefabricated Houses and Standardized Parts of Houses

3333. WORTH, W. J. **Problems of utilizing wood in prefabricated buildings.** *For. Prod. J.* 5 (6), 1955 (25*A*–28*A*).

Stress grading of small dimension lumber is urged. A solution is suggested to meet the need for adhesives applicable at the construction site. The need for a water-resistant adhesive, and for sorting and disposal of waste is discussed.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

3334. **Plywood shuttering for concrete.** British Plywood Manufacturers Ltd., Ponders End, Middlesex [*n.d.*]. pp. 6. P.R.

Technical data relating to the use of 'Invictus' plywood and 'Invictus' 'Shutterply'.

3335. NORÉN, B. Plywood och träfiberskivor till betongformar. **[Plywood and fibreboards for concrete shuttering.]** *Medd. Svenska TräforsknInst. (Träteknik)* No. 71*B*, 1955. pp. 12. 3 refs. [Sw.] (*Repr.* from *Byggnadsindustrin* [*Stockholm*] 1955 (11).)

Discusses the advantages (e.g. smooth hard surface, large sizes, strength, lightness, cheapness) of plywood, fibreboards and 'board-plywood' (a sandwich structure with fibreboard faces) and gives results, in graphs and tables, of tests on stiffness, bending strength, and swelling after soaking of the 3 materials.

3336. JANKOVIĆ, A. O jednom profilu složene grede. **[A particular profile of composite wood beam.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (203–12). 3 refs. [Croat.croat.g.]

The advantages of using the beam suggested are discussed on the basis of calculations. The beam is obtained by (1) cutting off the corners of a square beam so as to obtain an octagonal section, (2) sawing the beam in two along the diagonal of the original square, and (3) gluing together the two halves along the small faces parallel to that diagonal.

3337. WATANABE, H., and MATSUMOTO, T. **[Relationship between the depth and curvature of structural boards in a laminated-wood arch.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (25–6). [Jap.e.] P.R.

A formula for this relationship is developed.

3338. RADCLIFFE, B. M., and SUDDARTH, S. K. **The Purdue-Illinois nail-glued roof truss with a pitch of 3 : 12 and 4 : 12 for spans of 24 feet 8 inches and 28 feet 8 inches.** *Sta. Bull. Ind. agric. Exp. Sta.* No. 629, 1955. pp. 22. 5 refs.

Plans and design calculations are presented, with data on materials, gluing techniques and nail patterns.

3339. JOHNSON, J. W. **Lateral test on a 20- by 60-ft. roof diaphragm with stapled plywood sheathing.** *Rep. Ore. For. Prod. Lab.* No. *T*-13, 1955. pp. 9 + 9 plates. 5 refs.

The test was made to obtain data on the use of staples as plywood fasteners. The specimen took a maximum shear load of 1050 lb./linear ft. of diaphragm width, failure being caused primarily by staples pulling from the framing. The diaphragm with stapled sheathing was less rigid in the allowable deflection range than a similar diaphragm with nailed sheathing. Repetitive loading to 475 lb./linear ft. caused no significant increase in set or deflection rate. *From author's summary.*

3340. CURRIER, R. A. **Strength tests on full-scale plywood-sheathed wall sections.** *Rep. Ore. For. Prod. Lab.* No. *T*-15, 1956. pp. 6 + 12 photos + 2 dgms. + 1 gph + 3 tbls.

Six plywood-sheathed test units with Douglas-Fir frames, each consisting of 2 wall sections, 4 or 8 ft. wide × 12 ft. high, were tested. Walls fastened with 6d or 10d. common nails showed greater strength than those fastened with 6d or 10d. casing nails. Similarly constructed wall sections of 4- and 8-ft. widths reacted alike when compared on the basis of shear load per linear ft. of wall width.

3341. CURRIER, R. A. **Strength and stiffness of random-length, end- and center-matched 2-by-6-inch Douglas Fir decking.** *Rep. Ore. For. Prod. Lab.* No. *T*-14, 1955. pp. 9 + 4 tbls., 19 photos, dgms. and gphs.

Strength and stiffness of decking with end-matched joints occurring at random between supports (1) was compared with that having staggered butt-joints occurring only over supports (2). The decking was tested in the form of test panels with 6- and 8-ft. spans. For a given span, (2) deflected less than (1). Performance indices of (1) were developed by comparing deflections with those of (2) at various magnitudes of load on the two span lengths. Deflection of 6-ft. spans was 35–40% that of 8-ft. spans for the same type of end joint and comparable loads. Comparisons were also made on the panels' load-carrying characteristics at the deflection limits often prescribed for floors and

roofs, 1/360 and 1/240 of the span length respectively. [Results are tabulated.] *From author's summary.*

3342. GÖSELE, K. Der Schallschutz von Holzbalkendecken. **[Soundproofing wooden joist ceilings.]** *Holz-Zbl.* 82 (27), 1956 (353). [G.]

Beams 10 × 20–22 cm., now commonly used, allow excessive sound transmission at the points where ceiling and floorboards touch them, necessitating insertion of soft fibrous material or an independently supported ceiling.

3343. PAVLETIĆ, F. Iskorišćenje sirovine u proizvodnji parketa. **[Better utilization of the raw material in parquet manufacture.]** *Drvna Ind.* 6 (9/10), 1955 (9–14). [Croat.e.] P.R.

With parquet production in Croatia remaining below the capacity of the existing plants, and in view of the acute shortage of wood, it is important to increase considerably the present output of 32 sq. m. of parquet boards per cu.m. of raw parquetry strips. Reducing the thickness from 22·5 to 18 mm., and the tongue height from 5·5 to 3·3 mm., would raise the output to ca. 44 sq.m./cu.m.

3344. SCHNEIDER, P. (to Krauth and Co.) Herstellung von Parkettholzern aus Buchenholz. **[Manufacture of parquet flooring from Beech wood.]** *German Patent* No. 921,231, Dec. 13, 1954. pp. 2. [G.] P.O.

Freshly converted wood is treated with superheated steam at 4 atm. for about 72 hours, turning brown; it is then air-dried, sawn into slats, kiln-dried, and converted into finished parquet strips which are said to have only slight hygroscopic properties.

3345. ZISCHKE, D. A. **New veneer-lumber flooring developed for concrete slabs.** *Sth. Lumberm.* 191 (2393), 1955 (169–70).

'Flex-floor', now being tested at the Forest Products Laboratory, Madison, consists of a dense ⅛-in. hardwood veneer glued at right angles to a ⅝-in. backing of low-grade timber with tongued-and-grooved edges. It is sufficiently flexible to allow straight laying on concrete with a conventional mastic. Durability, as tested by a rolling load test, is stated to be equal to that of solid Red Oak.

3346. STERN, E. G. **Effectiveness of flooring nails in plywood subflooring.** *Bull. Wood Res. Lab. Va. polyt. Inst.* No. 21, 1955. pp. [6]. 1 ref. P.R.

Laboratory tests indicated that helically threaded Screw-tite flooring nails provided better service than plain-shank flooring brads or cut nails.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use.)

See also Nos. 3224, 3306, 3448.

3347. POPOVIĆ, V. Racionalno iskorišćavanje drveta pri izradi bukove i francuske dužice. **[Rational utilization of wood in the manufacture of Beech staves and French staves.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (99–139). [Croat.g.]

Cf. *For. Abstr.* 16 (No. 960).

3348. HARTSOCK, J. A. **An analysis of shook yields from box lumber.** *For. Prod. J.* 5 (6), 1955 (33*A*–36*A*).

Describes the results of analyses by a specially developed method of determining the effects of board width and shook grade on box-shook yields, applied to a typical sample of *Pinus ponderosa* box lumber.

3349. COUNTRYMAN, D. **Plywood used in containers.** *For. Prod. J.* 6 (1), 1956 (5–11). 11 refs.

Discusses the manufacture, properties and specifications of plywood containers. Requirements of various types of plywood listed in military container specifications are analysed and compared with similar grades from the Commercial Standards. Manufacturing processes and properties of Douglas-Fir plywood are reviewed. *From author's summary.*

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also No. 3354.

3350. BURGESS, P. F. **Dulang making.** *Malay. Forester* 19 (1), 1956 (28 + 8 photos).

Describes the method of making, by hand, the wooden dishes used for washing tin and gold. They were formerly made from the buttresses of *Koompassia malaccensis* or *Intsia palembanica*, but since buttressed trees are now scarce, Mersawa (*Anisoptera* spp.) is generally used, as having the requisite properties.

3351. CHUCHRJANSKI [HUHRJANSKIĬ], P. N. Reibungsteile aus gepresstem Holzstoff. **[Compressed wood as a material for bearings.]** *Textil- u. Faserstoff-Technik, Berlin* 4 (10), 1954 (605–6). [G.g.] Transl. from *Tekstiljnaja Promyšlennostj, Moskva* No. 12, 1953 (35–8). P.O.

Describes the manufacture of bushings made of compressed Beech, Birch, Ash or Aspen wood and stresses the use of bearings with such bushings in the textile industry.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See also No. 3287.

3352. CREIGHTON, J. W. **Choosing a hardwood lumber grade for furniture manufacture.** *For. Prod. J.* 6 (1), 1956 (11–5). 8 refs.

Analyses factors affecting the relationship between lumber quality and conversion cost. Under present manufacturing systems it is possible to process low-grade lumber into required cuttings at a lower net unit cost than higher grades. *From author's summary.*

3353. CHERRINGTON, E. C. **Malayan woods for furniture.** *Malay. Forester* 19 (1), 1956 (25–7).

Notes on the species most highly prized or commonly used for furniture (*Pterocarpus indicus, Diospyros polyalthioides, Balanocarpus heimii, Shorea* spp., *Intsia palembanica, Sindora* spp., *Melanorrhoea* spp., and *Gluta* spp.).

838. Vehicles (including Ships, Boats, Aircraft)

3354. ROY, J. C. **Utility of the forest products of Orissa in the fisheries of the Chilka Lake.** *J. Bombay nat. Hist. Soc.* 53 (2), 1955 (292–5). 6 refs. O.R.S.

Gives a list of species used for boats, nets, traps etc. rods and spears, with brief notes on their manufacture.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 3278, 3469.

3355. BOWES, P. C. **Spontaneous heating and ignition in sawdust-heaps.** *Wood* 21 (1), 1956 (20–2). 9 refs.

Reviews available information and considers some possible ways of reducing the risk.

3356. ROGER, N. F., GRIFFIN, E. L., REDFIELD, C. S., and KOEPP, W. H. **Pulp chips and tanbark from Hemlock slabs by air-flotation.** *For. Prod. J.* 5 (6), 1955 (400–5). 22 refs.

Describes a process developed for separating Hemlock slabs into a bark fraction suitable for tannin extraction and a wood fraction for pulping.

3357. HALE, J. D. **Thickness and density of bark; trends of variation for six pulpwood species.** *Pulp Paper Mag. Can.* 56 (13), 1955 (113–7).

Diameter-tape measurements were made on 400 trees over bark and under, at stump level and at 100-in. intervals along the bole. The trees, classified as to age in 20-year intervals, ranged from 7 to 11 in. d.b.h. Bolt diameters were taken down to 3 in. u.b. Species included were *Abies balsamea*, *Picea mariana*, *P. glauca*, *Pinus banksiana*, *Populus tremuloides* and *Betula papyrifera*. Graphs show the relation between bark thickness and bolt diameter u.b. with indications, along the curves, of bark % volume for each species. Other graphs show similarly the relation between oven-dry bark weight/cunit barked wood and u.b. diameter of bolts.

3358. MILLIKEN, D. E. **Determination of bark volumes and fuel properties.** *Pulp Paper Mag. Can.* 56 (13), 1955 (106–8). 1 ref.

Gives a table showing oven-dry bark weight/cunit [100 cu. ft.] of barked wood, density, chemical analyses, and heating values, and indicates correlations (if any) with age, area and species. The order of excellence in heating was Balsam Fir, Jack Pine, Poplar, Spruce. Also covered are Spruce (3 species), White and Yellow Birch, Hard and Soft Maples, Soft Elm, Beech, Tamarack and Eastern Hemlock.

3359. ANDERSON, J. D. **Application of bark data to furnace designs.** *Pulp Paper Mag. Can.* 56 (13), 1955 (111–2).

Discusses the application of the data [cf. preceding abstract] to the design and testing of bark-burning equipment. These data cover (*a*) proximate and (*b*) ultimate analyses, and (*c*) ash analyses and fusion points. In mean values of % dry weight, (*a*) showed 72–79 volatile hydrocarbons, 17–24 fixed C, and 2–4 ash (except Beech and Elm 8%). This indicates that the bulk of the combustion air should enter close above the fuel bed. The higher heating values of the data (which would affect the size of dutch oven or spreader stoker selected) range too widely for specific recommendations. Mean values in (*b*) were 52·5 C, 6·0 H and 38·5 O. Low H results in low air requirements and hence dry gas loss, which affects the size of steam-generating unit required. From (*c*), the fuel-bed clinkering expectation can be deduced, and how much furnace heating surface is required to prevent slagging. These troubles are not usually experienced except in salt-water-borne bark.

3360. ANDERSON, W. C. **Can slabs from small sawmills be salvaged at a profit?** *Sth. Lumberm.* 191 (2393), 1955 (185–8).

The author's calculations show that slabs from small mills, sold for chipping at a concentration yard, can yield a profit to both mill and yard operator. If slabs are barked at the mill, or if logs are barked before cutting, the sawmiller's profit will be greater. A small cutter-head slab barker for this purpose, and a large hydraulic slab barker for use at a concentration yard are described and illustrated.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 2848, 3216, 3388, 3458.

3361. BERKEL, A. Ağaç malzeme emprenye sanaiimizin bugünkü durumu. **[The present situation of our wood impregnation industry.]** *Istanbul Üniv. Orm. Fak. Derg.* 4 (1), 1954 (7–32). [Turk. turk.]

An account, with illustrations and a lay-out plan, of the only plant in Turkey, at Derince. This can treat ca. 450,000 Oak and Beech sleepers per year, and also posts and bridging timber of Pine, using creosote and the Rüping process.

3362. BAVENDAMM, W. Holzschutztagung in Ost-Berlin. **[Meeting on wood preservation in East Berlin.]** *Holz-Zbl.* 82 (25), 1956 (329–30). [G.]

The following papers were presented during the meeting (Feb.2–3, 1956): 'Movement of liquids in wood during impregnation under pressure' (*W. Gillwald*):—The final effect of impregnation depends on factors related to anatomical features of the wood, properties of the impregnant, and method applied (heat, pressure, vacuum). The part played by the flow of the impregnant is stressed; both the microscopic and macroscopic approach to the problem lead to the formula p (pressure) $= a + bt$ (t being time, a and b constants). Application of this formula results in improved impregnation, particularly with the more difficult woods. 'Preservation of composite wood' (*T. Perkitny*):—Describes the author's (patented) method of making composite-wood sleepers. Grooves are made in the wooden elements to be glued, and filled with the hot impregnant, which serves the dual purpose of preservative and heating medium (140° C.) to promote the curing of the phenolic glue used. This

method is also used for making piles in Poland and the U.S.S.R. 'Impregnation of veneers with synthetic resin in the manufacture of barrel staves' (*W. Scheibert*):—Describes a new patented method for controlled introduction of small quantities of phenol-formaldehyde condensation product into wood. 'Quantitative and qualitative determination of impregnating salts in wood' (*E. Baumgärtel*):—Describes a new alkaline digestion of wood, enabling F, As and Cr to be determined in the same wood sample. 'After-treatment of structural timber with the aid of the Eberswalde pressure apparatus' (*R. Kresse*):—Describes the impregnating apparatus designed by Gillwald and Jonat in 1951 for the after-treatment of marine timbers, and used recently for the after-treatment of sleepers *in situ*. 'A new method for impregnating Beech heartwood' (*Černaev*):—A special pressure apparatus was developed to impregnate the wood (with red false heart) from inside. A mixture of 80% diesel-oil with 20% creosote gave encouraging results. 'Compatibility of wood preservatives with building materials' (*G. Langendorf*):—Tests on the interaction between mortars and fungicides. NaF is unsuitable, KF and silicofluorides are recommended. Other tests refer to corrosion of steel. Finally the effect of ceiling fillers on the intensity of *Merulius lacrymans* attack on timber was investigated.

3363. NISHIMOTO, K., and INOU(Y)E, Y. **[Studies on wood preservatives. XV. On the properties of treated wood.]** *Wood Res., Kyoto* No. 14, 1955 (27–36). 8 refs. [Jap.e.]

Compressive strength of *Cryptomeria japonica*, *Chamaecyparis obtusa*, *Pinus densiflora*, *Fagus crenata* and *Castanea crenata* treated with different preservatives was tested. Results are given in tables [with some English legends]. Boliden salt was effective as a preservative (equal to creosote) but tended to reduce compressive strength after some time. Malenit (NaF + dinitrophenol + SbF_2) also tended to reduce compressive strength, and was less effective than other preservatives. Creosote and 5% PCP pine-root oil solution were effective and did not reduce strength, but both stained the wood badly. The Bethell and Lowry processes were used; both were equally effective. The test pieces were too small for differences in osmotic pressure between the two methods to be observed. *From authors' summary.*

3364. YONEKAWA, S. **[Studies on the new water borne preservative.]** *Wood Ind., Tokyo* 11 (3), 1956 (143–50). 11 refs. [Jap.e.] P.R.

The preservative consists of the two complex salts, ammonium copper pentachlorophenate

$$(C_6Cl_5.O)_2Cu(NH_3)_4$$

and ammonium copper chromate $(NH_3)_4CuCrO_4$, produced by the reaction of aqueous solutions of Na pentachlorophenate and $K_2Cr_2O_7$ with an ammoniacal solution of $CuSO_4$. The salts are very toxic and stable. The preservative is strongly toxic, water-resistant, resistant to weathering, non-toxic to humans, does not attack iron, does not reduce wood strength, has no smell and is not dirty, is not inflammable, and can be painted on. *From author's summary.*

3365. HÄGER, B. O. (to Bolidens Gruvaktiebolag). Sätt för framställning av medel, speciellt avsett för konservering av trä och andra organiska material, samt sålunda framställt medel. **[Method of preparing a preservative for wood and other organic materials and the preservative thus prepared.]** *Swedish Patent* No. 139,177, Feb. 17, 1953. pp. 3. [Sw.] P.O.

The preservative contains hexavalent Cr and pentavalent As combinations. It is prepared in an acid (e.g. arsenical) medium of chemical combinations selected so that the radicals to form part of the preservative remain in solution while the other radicals separate out as insoluble substances.

3366. SCHULZE, B. Zur Haltbarkeit (Lagerbeständigkeit) anorganischer im Holzschutz verwendeter Fluorverbindungen. **[Keeping properties of inorganic fluorine compounds used in wood preservation.]** *Holzforschung, Berlin* 9 (1), 1955 (18–20). [G.g.e.]

Tests extending to 6 months gave results, presented in tables and a graph, on the variation of water and F content under different storage conditions of NaF, $MgSiF_6$, KFHF, NH_4FHF, and mixtures of fluorine preservatives.

3367. GENT, P. K. VAN. **The VAP test—an indication of the possible presence of pentachlorophenol in timber.** *South African Industrial Chemist, Johannesburg* 9 (4), 1955 (78–9). 8 refs. P.O.

1 g. of vanillin and 1 g. of phloroglucinol are dissolved in 100 c.c. of absolute alcohol, and a few drops of the solution placed on the bottom of an upturned porcelain dish and allowed to dry. The dish is then held just above an ignited specimen of the wood so that the vapours impinge on the dish. The presence of Cl is indicated by a red ring forming round the crystals.

3368. NISHIMOTO, K., FUSE, G., and INOU(Y)E, Y. **[Studies on wood preservatives XVI. On the methods of detecting pentachlorophenol in wood.]** *Wood Res., Kyoto* No. 14, 1955 (37–41). [Jap.e.]

Wood impregnated with Na salt of PCP is kept in contact with ClO_2 for about 3 hours until the PCP is oxidized, then washed, dried, and sprayed with 50/50 dimethylanilin-benzol solution, which gives a clear violet-blue colour to the part of the wood containing PCP. Specimens of *Chamaecyparis obtusa* impregnated with Na salt of PCP by the Bethell process were examined, using the ClO_2 and the conventional $CuSO_4$ methods. Results are shown in photographs. *From authors' summary.*

3369. FARBWERKE HOECHST A.-G. Verfahren und Mittel zur Tiefimprägnierung von Holz. **[Processes and preservatives for the deep impregnation of wood.]** *Austrian Patent* No. 180,725, Jan. 10, 1955. pp. 2. [G.] P.O.

Oily chlorinated saturated aliphatic hydrocarbons (10–20 C atoms) with 30–60% Cl, used with creosote, chloronapthalene, etc., advantageously in the form of a paste with salts and emulsifiers, particularly for the after-treatment of standing transmission poles.

3370. GILLWALD, W., and JONAT, G. Imprägnieren von Holz in Druckkesseln. **[Impregnation of timber under pressure.]** *German Patent* (*East Germany*) No. 4771, May 10, 1954. [G.] From *abstr.* in *Chem. Zbl.* 126 (28), 1955 (6649). [G.] L.S.

The maximum pressure, reached gradually after the initial vacuum, depends on the species, density, moisture content etc., the subsequent treatment being conducted in the usual way.

3371. ZYSKA, B. Wpływ warunków nasycania na nasycalność wilgotnych kopalniaków. **[Effect of the conditions of impregnation on the absorptivity of green pitprops.]** *Przegląd Górniczy* [, *Katowice*] 10 (6), 1954 (14–6). [Pol.] From *abstr.* in *Referat. Ž.* (*Him.*) 1955 (13), (No. 27818). [Russ.] P.O.

Pitprops 1·25, 2·5 and 3 m. long, at 61 ± 13% moisture content, were pressure impregnated with a 2% NaF solution at 60–70° C. Higher concentrations, other F compounds, and longer impregnation, did not increase the proportion of absorbed solution. This depends on the pressure and vacuum used.

3372. KUKRA. Anerkennung für eine bedeutende Erfindung. **[Award for an important invention.]** *Wald* 2 (12), 1952 (353–5). [G.]

Equipment for re-impregnating wooden structures in water at the danger point ca. 80–110 cm. above normal water level, by means of hollow borer heads with slits designed to inject preservatives in all directions in the wood. The solution is fed through rubber tubes, using compressed air to give controlled pressures of up to 20 atm.

3373. BELOPITOV, N. Nov metod za impregnacija na stălbove. **[A new method of impregnation of poles.]** *Elektroenergija, Bulgaria* 4 (5/6), 1953 (21–3). [Bulg.] From *abstr.* in *Referat. Ž.* (*Him.*) 1955 (1), (No. 1335). [Russ.] P.O.

Discusses methods of impregnation with NaF solutions, with special reference to bandage treatment.

3374. WALTERS, C. S., and PETERSON, K. R. **Report on Project 301-A. Preservative treatment on fence posts by cold-soaking in pentachlorophenol fuel-oil solutions.** *For. Note Ill. agric. Exp. Sta.* No. 63, 1955. pp. 2 + 2 tbls.

Cf. *For. Abstr.* 15 (No. 2976).

3375. WALTERS, C. S., and PETERSON, K. R. **Report on project 301-C. Preservative treatment of fence posts with toxic oil solutions by cold-soaking, dipping, and brushing.** *For. Note Ill. agric. Exp. Sta.* No. 64, 1955. pp. 4.

Cf. *For. Abstr.* 15 (No. 4247).

3376. GÖHRE, K. Holzschutzmittelkurzprüfung mit Hilfe der statischen Biegefestigkeit. **[A rapid test, based on static bending strength, for wood preservatives.]** *Arch. Forstw.* 4 (4), 1955 (293–301). 5 refs. [G.g.] [Institut für physikalische Holztechnologie, Eberswalde.]

[Cf. *For. Abstr.* 14 (No. 3862), 16 (No. 3531).] The standard, DIN 52 176, consists in impregnating pieces of Scots Pine sapwood 50 × 25 × 15 mm. with 10 concentrations of the preservative under test, drying them for one month, ascertaining the weight of preservative retained, and placing them with untreated controls in flasks separately containing *Coniophora cerebella*, *Poria vaporaria* and *Lentinus lepideus* cultured on Spruce groundwood-pulp card, soaked in 8% malt extract. The temperature and relative humidity are held at 20° C. and 60–70% for 3–4 months, when the pieces are oven-dried and weighed. The lowest retention of preservative at which no loss in weight occurs is the criterion for effectiveness. This test takes 4–5 months. Methods aiming at more rapid tests are discussed. Among available criteria, reliance on the loss in strength in compression and bending is preferable to that of tensile and impact bending, as the values of the latter vary widely. The loss of static bending strength (90 pieces subjected to *C. cerebella*) is shown to vary almost linearly with loss of weight from the 3rd to the 8th weeks. After detailing exploratory tests with the 3 fungi with both water- and oil-borne preservatives and a pilot leaching test (requiring a total of 45 days), the author proposes the following standard: test pieces 15 × 10 × 4 mm. with the long edge parallel to the grain, 6 being impregnated at each concentration and 6 steam-sterilized controls per flask. Other differences from DIN 52 176 are 5% malt extract for the medium, drying specimens after impregnation for only one week, and exposure to fungi for only 3 weeks, making a total of 4 weeks *vs.* 4–5 months for the present standard. The instrument for measuring static bending strength (developed for testing plastics) is illustrated.

3377. MEYER, K. Zum Holzschutz und seiner Durchführung beim technisch verwendeten Pappelholz. **[Wood preservation methods for Poplar wood in industrial use.]** *Abstr.* in *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 1, 1954 (136–7). [G.]

Small sticks cut from freshly felled mature Poplars (× *Populus serotina*, × *P. regenerata* and × *P. robusta*) were exposed in the laboratory to a number of decay fungi after vacuum treatment with commercial preservatives in rising concentrations, and their resistance then tested by impact-bending tests. No marked difference was found between the three species, but sapwood was more susceptible than heartwood.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

See also Nos. 3253, 3362.

3378. GOTO, T., and KADITA, S. **[Studies on impregnated woods. VII. Relation between the phenol to formaldehyde ratio and dimensional stability.]** *Wood Res., Kyoto* No. 15, 1955 (24–37). 10 refs. [Jap.e.]

Results, shown in graphs and tables [with English legends], of experiments on *Chamaecyparis obtusa* and *Betula nikoensis* were as follows: (1) Optimum

dimensional stabilization using unpolymerized water-soluble phenol resin was obtained with the formaldehyde/phenol ratio 1·0–1·5 : 1·0. (2) Unpolymerized phenol-formaldehyde resin gave better dimensional stabilization than commercial phenol resins. (3) The mechanism involved in stabilization seemed to be mainly a bulking effect. (4) No relation was found between variations in the formaldehyde/phenol ratio and mechanical properties of the air-dry wood. *From authors' summary.*

3379. GOTO, T., and KADITA, S. **[Studies on impregnated woods. VIII. Relationship between the solvent (used with the unpolymerized water-soluble phenol-formaldehyde resin) and dimensional stability.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (30–4). 6 refs. [Jap.e.] P.R.

Wood specimens were impregnated with 20% resin solutions in water, methanol, ethanol, isopropanol, *n*-butanol, acetone, and aniline, then cured, soaked in water, and air- and oven-dried; the anti-shrink efficiency was next calculated on the basis of the dimensional change from the leached swollen condition to the final oven-dry condition. It was found that: (1) in water and monohydric alcohols, the increase in the dielectric constant and the decrease in the molecular weight of the solvent cause an increase in the tangential dimensions and weight of the specimen after resin treatment; (2) the anti-shrink efficiencies of water, methanol and ethanol are almost the same; (3) solutions in acetone and aniline caused considerable swelling and a high anti-shrink efficiency.

3380. VINOKUROV, D. M. Izmenenie nabuhanija, gigroskopičnosti i himičeskogo sostava drevesiny, propitannoĭ gljukozoĭ, pri pjezotermičeskoĭ obrabotke. **[Variation in swelling, hygroscopicity and chemical composition of wood impregnated with glucose during heat and pressure treatment.]** *Naučnye Trudy Ljvovskogo Lesotehničeskogo Instituta* 1, 1954 (90–103). [Russ.] From *abstr.* in *Referat. Ž. (Him.)* 1955 (19), (No. 44749). [Russ.] P.O.

Impregnating Birch wood with 20% glucose solution, followed by heating for 3 hours at 160° C. under a pressure of 200–250 kg./sq. cm., reduces swelling (by weight and by volume) in water by 72–74% and hygroscopicity (in a relative humidity of 92%) by 9·5%, compared with untreated wood. Caramelization of the glucose yields oxymethylfurfural, methylfurfural, furfural and formaldehyde, and organic acids. The treated wood contains more lignin (23·68 *vs.* 18·69%), and less pentosans (22·83 *vs.* 29·7%), than untreated wood; the newly formed lignin-like substances are soluble in 1% NaOH. The cellulose content remains almost unchanged, but its Cu value is higher, and the cuprammonium solution has a small viscosity.

3381. BURO, A. Die Wirkung von Hitzebehandlungen auf die Pilzresistenz von Kiefern- und Buchenholz. **[Effect of heat treatment on the fungus resistance of Pine and Beech wood.]** *Holz Roh- u. Werkstoff* 12 (8), 1954 (297–304). 29 refs. [G.g.] P.R.

Samples, 3 × 3 × 0·5 cm., of Pine sapwood and Beech wood were heated in air and N at temperatures ranging from 125° to 250° C., after which their physical properties and resistance to *Coniophora cerebella*, *Lentinus lepideus* and *Polystictus versicolor* were examined. Heat treatment increased the resistance to fungus attack in direct relation to the heating temperature and the loss in weight, a 100% increase in fungus resistance being attained when the weight loss was 8–10%. The author believes that heat treatment causes chemical changes (e.g. condensation and ether-bridge formation) of such a nature that the resulting structures are less susceptible to the specific enzymes that act as catalysts for fungal decomposition.

3382. BURO, A. Untersuchungen über die Veränderung der Pilzresistenz von Hölzern durch Hitzebehandlungen in Metallschmelzen. **[Investigations on the change in the resistance of wood to fungal attack by heat treatment in molten metals.]** *Holzforschung, Berlin* 9 (6), 1955 (177–81). 7 refs. [G.g.e.] P.R.

Clear Pine-sapwood and Beech-wood test-pieces became more resistant to attacks by wood-destroying fungi after heating in a molten metal alloy (Pb/Cd/Bi) than after heating in air or N. The increase of resistance was due partly to the toxic effect of Pb and Cd. After heating in the alloy, the test-pieces were immune to *Coniophora cerebella* and *Lentinus lepideus* and resistant to *Polystictus versicolor*.

844. Attack by Plant Organisms

See also Nos. 2951, 2964.

844.1. Sap-staining and Mould Fungi

See also Nos. 3068, 3433.

3383. ROGISTER, J. Het verblauwen van hout. **[Bluestain in wood.]** *Meded. Lab. Houttechnol., Gent* No. 13, 1955. pp. 78. 110 refs. [Flem.flem.f.e.g.]

Part I is a review of world literature on bluestaining fungi, conditions favouring their development, species attacked, effect of bluestain on wood properties, association of fungus and insect attack, and control. Part 2 gives the results of laboratory experiments on Poplar blocks subjected to various treatments and inoculated with *Botryodiplodia theobromae*. They include the following: (1) No correlation is apparent between intensity of discoloration and moisture content of freshly cut timber. That felled in March, April and July seems most susceptible, while that felled in December, May and June showed no bluing after inoculation and a fortnight's incubation. (2). Resistance to bluing increased with increasing time from felling when unbarked sections were left to season slowly and inoculated at regular intervals, but wood felled in August–December always showed an increase in susceptibility in February and March. (3). Steaming freshly felled or older timber under atmospheric or high pressure caused a considerable increase in bluing, this increase decreasing with time since felling. Discoloration in February–March is higher than for the preceding months. High-pressure steaming caused a greater intensity

of bluing than atmospheric steaming. (4). Bluing is rare in untreated wood at moistures below fibre saturation point (f.s.p.), but even in old timber (9 months since felling) considerable bluing often occurred below f.s.p. after steaming. (5). Steamed and severely discoloured wood reached equilibrium moisture after drying, more rapidly than steamed but not discoloured wood. (6). Drying wood blocks at 60–80° C., or air drying, generally increased the bluing intensity until moistures below f.s.p. were reached. Samples 1–2 months old soon reached moistures below f.s.p., and no bluing took place. (7). Steaming before air drying increased the amount of bluing. (8). Samples dried to 0% m.c., then soaked in water for up to 1 hour, were attacked more severely than freshly felled untreated samples. Soaking in warm water (50° C.) caused more severe bluing than soaking in cold. (9). Boiling the samples for ¼–½ hour increased the severity of bluing in the same way as steaming.

3384. AOSHIMA, K., and HAYASHI, Y. **[*Endoconidiophora coerulescens* Münch, causing sap-stain of Yezo Spruce (*Picea jezoensis*) in Japan.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (19–30). 9 refs. [Jap.jap.e.]

An illustrated account of this new record, covering cultural characteristics, morphological description and a comparison with the European representative, with which it wholly agrees. It differs from forma *douglasii* in host, substratum, and shorter ascospores. Inoculations of the Spruce and of *Pinus densiflora* caused blue-grey staining. Black hyphae invade the pith rays and tracheids, entering the latter by their bordered pits.

844.2. Wood-destroying Fungi

See also Nos. 2489, 2853, 2926, 2956–60, 3376, 3381–2, 3422.

3385. WESTHUIZEN, G. C. A. VAN DER. **Some common woodrotting fungi.** *Fmg. S. Afr.* 30 (356), 1955 (485–6). E.M.B.

Brief notes on *Stereum hirsutum, Trametes proteus, Polyporus cinnabarinus* and *Schizophyllum commune*.

3386. LINDGREN, R. M. **Color test for early storage decay in Southern Pine.** *Rep. U.S. For. Prod. Lab., Madison* No. 2037, 1955. pp. 4 + 1 photo. 5 refs. P.R.

To detect the presence of early infection by *Peniophora gigantea* in the sapwood of stored Southern Pine roundwood, a small amount of Alizarine Red S is sprayed on freshly exposed end-grain surfaces. It stains infected sapwood yellow and uninfected sapwood pink to red. The test is not sensitive to the presence of staining or mould fungi.

3387. KRSTIĆ, M. Jedan eksperiment inhibicije *Schizophyllum commune* Fr. na bazi antagonizma. **[An experiment on the inhibition of *S. commune* by antagonism.]** *Zašt. Bilja* No. 25, 1954 (42–4 + plate). [Croat.e.] I.M.I.

Mycelium and metabolic products of *Penicillium crustaceum* inhibited growth of *S. commune* in culture. Specimens of Beech wood previously infected with the mould and then exposed to *S. commune*, remained unattacked. Further experiments are needed to show whether this offers promise of biological control of *S. commune* on Beech wood under natural conditions.

3388. SHINJYO, M., and KAWASAKI, T. **[Studies on the preliminary preservation of Beech lumber [to be used] for pulp-making.]** *Wood Ind., Tokyo* 11 (3), 1956 (138–42). 2 refs. [Jap.e.] P.R.

Cut ends of logs were sprayed with the Na salt of PCP, as a 5% water solution with or without subsequent treatment with a 1% solution of $ZnSO_4$ to fix the PCP in the form of the Zn salt. This spraying gave good protection at the ends and also had some interior effect. Treatment with $ZnSO_4$ gave better results, as the Zn salt of PCP is less soluble in water than the Na salt. *From authors' summary.*

845. Attack by Animals

845.1. Marine Borers

3389. PALEKAR, V. C., and BAL, D. V. **Marine organisms injurious to submerged timber in the Bombay harbour.** *J. Bombay nat. Hist. Soc.* 53 (2), 1955 (201–4 + 3 plates). 5 refs. O.R.S.

A survey of the marine borers from Bombay, carried out during 1953–54, revealed 4 species of *Teredo*, 3 of *Bankia* and 2 of *Martesia*. Most common among them were *T. reynei, B. setacea* and *M. striata*. Notes, with illustrations, are presented on these borers and the localities of their occurrence in the harbour.

3390. SRINIVASAN, T. K. **Crustaceans in relation to underwater timber structures.** *Curr. Sci.* 24 (10), 1955 (342). 6 refs. A.P.B.

A survey was made of crustaceans associated with underwater timbers of the Madras coast. The most important borers are *Sphoeroma vastator, S. walkeri, Exosphoeroma* sp. and *Metoponorthus pruinosus*, which damage structures of Teak, Mango, *Xylia xylocarpa, Cedrela* sp. and *Terminalia* sp.

3391. BRACEY, P. **Urea/formaldehyde resin as a vehicle for semi-permanent marine anti-fouling coatings.** *Journal of the Oil and Colour Chemists' Association, London* 36 (396), 1953 (322–9). 2 refs. L.S.

Lacquers of urea/formaldehyde resin containing DDT prevented fouling by barnacles (*Elminius* etc.) for 2 years on wood surfaces (Birch, also small Pine blocks) in an estuary, and for 1 year in a harbour. Dieldrin and γ-BHC were not successful. Further experiments are being done.

3392. **Protection of saw-logs against marine borers.** *Pulp Paper Mag. Can.* 57 (2), 1956 (67–80). 6 refs. [Division of Applied Biology, British Columbia Research Council.]

Recommendations based on experiments and observations are made in the following papers: (1) Treatment of flat rafts by ponding. (*P. C. Trussell, C. J. Anastasiou,* and *C. O. Fulton*)—To kill the borer in a 7-sectioned flat raft, a pond, 500 × 80 × 4 ft. deep, should be dug between tide lines. The raft is sunk into this on the ebb and left

to soak there, for the 6–7 hours between tides, in water carrying 70 p.p.m. of As_2O_3 as Na arsenite. A freshwater solution of this substance is fed into the circulation of a pump withdrawing water from the pond and spraying it on to the logs. The cost of the poison is $100/raft. (2) Treatment of deep-sea rafts. (*P. C. Trussell, C. O. Fulton, C. J. Anastasiou* and *R. E. Gillespie*)—A Davis raft (400 × 80 × 16–20 ft. deep, and drawing 8–12 ft. of water) contains 1½–2 million bd. ft. worth up to $80,000. *Bankia setacea* can do $10,000 damage to a single raft. To kill the borer in such rafts and to reduce re-infestation during the season of free-swimming larvae, each of the 10 sections of the raft should be sprayed to deliver 272 lb. As_2O_3-equivalent/section. Lower dosages (probably adequate) are not justified in economy as the poison at this rate costs only $400–500. The actual volume of solution sprayed on to the raft should equal 15–20% of the volume of water contained in the raft. Protection was proved for 67 days, reinfestation being negligible in amount and penetration. (3) Storage-ground study (*P. C. Trussel, B. A. Greer* and *R. J. Le Brasseur*)—Minimum salinity for the borer's survival is 8 parts/1000 for 6, or 10 parts/1000 for 10 days. Near the foreshore W. of Vancouver city it required a flow of the Fraser river 100 miles up-stream of 70,000 cusecs. to maintain sufficient dilution to prevent adult borer growth in floating logs. *Bankia* larvae were absent in surface water throughout the year, indicating safe storage for uninfested logs. The penetration rate in logs periodically beached by the ebb was reduced. The salinity of the bottom water in the mud flats during flooding was adequate for *Bankia* activity throughout the year.

845.2. Terrestrial Borers

See also Nos. 3010, 3399.

3393. KOVAČEVIĆ, Ž. Dva nova americka drvna štetnika u Evropi. [**Two new American wood pests in Europe.**] *Drvna Ind.* 6 (4/5), 1955 (12–4). 6 refs. [Croat.] P.R.

Describes *Lyctus planicollis* and *Xylosandrus germanus*, their biology, damage, prevention and control.

3394. SMITH, R. H. **The effect of wood moisture content on the emergence of Southern Lyctus beetle.** *J. econ. Ent.* 48 (6), 1955 (770–1).

Seventeen half-round billets of Oaks and Hickory, infested, 6 months before the test, with *Lyctus planicollis*, were cut in halves and held at 12% and 8% m.c. for comparison. From each of the former about 34% more beetles emerged than from the latter. In a greenhouse where m.c. was held at 15–18% the emergence was doubled. Emergence from the moister wood was no earlier.

3395. SIMEONE, J. B., and MACANDREWS, A. H. **The old house borer in New York State.** *J. econ. Ent.* 48 (6), 1955 (753–4). 1 ref.

Adds to those compiled by Leonard (1926), new records made since 1950 of *Hylotrupes bajulus* in a preliminary survey to find whether this pest is increasing. These new records are mapped. The chief timbers affected are Southern Pines, *P. strobus*, *P. monticola* and *Tsuga canadensis*.

3396. BECKER, G. **Investigations on the suitability of contact insecticides for wood preservation.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 2732, 1955. pp. 11 + 1 tbl. 8 refs. Transl. by H. E. Kijlstra from *Holz Roh- u. Werkstoff* 11 (2), 1953 (45–50). [See *For. Abstr.* 15 (No. 1981).] Limited distribution.

3397. DUFFY, E. A. J. ***Trinophylum cribratum* Bates, (Col., Cerambycidae). A new Indian pest of British timber yards.** *Entomologists' Gazette, Feltham, Middlesex* 4 (4), 1953 (254–64 + 3 plates). 9 refs. L.S.

Describes the adults and larvae of the species, their biology and mode of damage, and traces the history of their occurrence in Great Britain since 1946. Infestations have been found on *Quercus*, *Fagus*, *Carpinus*, *Juglans*, *Larix*, *Pinus*, *Betula*, *Platanus* and *Fraxinus*. Barking, within the 6 months the larva takes to penetrate to the wood, is recommended for control. [Cf. *For. Abstr.* 15 (No. 4271).]

3398. THIELMANN, K. Schutz des Rundholzes im Wald. Ein Grossversuch zum Schutz der im Wald lagernden Fichtenstammhölzer durch Begiftung der Rinde. [**Protection of round timber in the forest. A large-scale trial of poisoning the bark of Spruce logs stored in the forest.**] *Holz-Zbl.* 82 (16), 1956 (173). [G.]

Ca. 7000 cu.m. of large Spruce logs from windthrow areas were sprayed with a diluted colloidal DDT preparation (*Gesarolpaste*), those cut in winter between 10 and 15 April, those logged later, immediately after cutting. The bark was covered with a thin, rain-resistant film applied by knapsack sprays with dual nozzles. Inspection in early August showed 80–90% of the logs to be practically free from barkbeetle attack, and also from the splits and stains frequently developing after barking. The remainder, mostly sprayed during bad weather, showed slight infestation by *Ips chalcographus* and occasionally by other spp. Infested logs were barked, the others resprayed if they remained in the forest. Even logs removed after 10 months were reported to be in good condition. Spraying costs varied from 0·50 to 0·80 DM./cu.m. and were less than for barking.

845.3. Termites

See also No. 3027.

3399. BECKER, G. Einige Beobachtungen über holzzerstörende Insekten (Termiten und Käfer) in Guatemala. [**Observations on wood-destroying insects (termites and beetles) in Guatemala.**] *Z. angew. Ent.* 35 (3), 1953 (339–73). 42 refs. [G.g.] I.I.E.

Presents notes, largely from the author's own observations, on life history, type and extent of damage, and geographical distribution in Guatemala. Most destructive are the termites, particularly *Cryptotermes brevis* (found up to 2400 m. alt.), *Heterotermes convexinotatus*, *H. tenuis*, *Coptotermes crassus*, *C. niger*, *Nasutitermes corniger* (found at

higher altitudes than any other termite in Guatemala, and also in the capital), *Nasutitermes ephratae* and *N. nigriceps*, which is widespread in the hot regions. Observations on Coleoptera were made mainly on wood of *Pinus* spp. at altitudes > 2000 m. Thirty-one species are reported.

3400. GAY, F. J., GREAVES, T., HOLDAWAY, F. G., and WETHERLY, A. H. **Standard laboratory colonies of termites for evaluating the resistance of timber, timber preservatives, and other materials to termite attack.** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 277, 1955. pp. 60 + 4 plates. 16 refs.

Describes a method evolved for maintaining *Nasutitermes exitiosus*, *Coptotermes lacteus* and *C. acinaciformis* in laboratory colonies, and the practical use of these for demonstrating: (1) the variation in natural resistance between a number of timber species and within an individual species, and (2) the comparative value of preservatives (As_2O_3 and As_2O_5 in different concentrations).

3401. HERFS, A. Wie verhält sich Gebirgslärchenholz gegenüber Termitenfrass? [**Mountain Larch and termite attack.**] *Anz. Schädlingsk.* 29 (1), 1956 (2–5). 3 refs. [G.]

Three series of specimens from Larch grown at high altitudes were subjected to attack by *Reticulitermes lucifugus* under reproduced tropical climatic conditions. These specimens, although not classifiable as termite-resistant, showed greater resistance to attack than specimens from trees grown under milder conditions in the Rhineland.

846. Steaming

See also No. 3383.

3402. BARLAI, E. Az akác ipari felhasználhatósága. [**The industrial utilization of Robinia wood.**] *Erdö* 4 (2), 1955 (61–4). [Hu.]

Comparative physical and mechanical data [source not indicated] are presented showing the timber of Robinia to be superior to that of Oak in all respects save workability and colour. An account is given of changes in static strength properties (e.g. ca. 50% decrease in resistance to bending), colour (bronze to chestnut brown) and hardness, under steam treatment at 100 to 140° C. for 18–72 hours, designed to render the wood more acceptable to the furniture industry. Costs amount to 80–100 Forints/cu.m. only.

847. Drying (Seasoning)

See also Nos. 3218, 3324–6, 3383.

3403. **List of publications on the seasoning of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 446, 1956. pp. 18. P.R.

Lists publications which have appeared since ca. 1930 in Technical Notes, Madison Reports and elsewhere, dealing with research done by Madison staff.

3404. SCHEFFER, T. C. **Humidity controls for conditioning rooms.** *Rep. U.S. For. Prod. Lab., Madison* No. 2048, 1956. pp. 4 + 2 photos, 3 dgms.

Describes the design and operation of wood-element hygrostats for maintaining constant humidity in small rooms, and tension-type hygrostats (hair, animal skin, tubular wood, horn) for large rooms.

3405. TOKER, R. Yakacak odununda fire denemeleri üç aylık ara neticeler. [**Tests in relation to the loss of weight in woods for fuel in the zone of Trakya.**] *Bolu Orm. Araşt. Istasyon tek. Bült.* No. 1, 1954. pp. 16 + 1 map + 8 gphs + 1 tbl. 8 refs. [Turk.e.]

A first report on experiments to determine moisture loss in round fuelwood stacked under ordinary conditions, in various parts of Turkey, a country where fuel is sold by weight and not volume. Figures for *Fagus orientalis*, *Carpinus orientalis*, and *Quercus* spp. from the Trakya forest (an area supplying Istanbul and in the transition zone between the coastal and continental climate) for 125-kg. open-air stacks in- and outside the forest show that % moisture losses after 3 months' exposure (following September cutting) vary between 11·6 and 9·1% only; heavy rain fell during the period. Experiments are to continue.

3406. KAUMAN, W. G., and CAMPBELL, G. S. **Seasoning of Klinki Pine from New Guinea.** *For. Prod. News Lett. C.S.I.R.O. Aust.* No. 214, 1955 (3–4). 1 ref.

A tentative schedule is given for green mixed stock 1–1¼ and 1½–2 in. thick of this outstandingly amenable species, which can be dried in the dimensions given from 70 to 12% m.c. in 27 and 54 hours respectively without significant degrade. [Cf. *For. Abstr.* 17 (No. 3182).]

3407. KIMBALL, K. E. **Drying schedule for thin Red Oak.** *Sth. Lumberm.* 191 (2393), 1955 (252, 254). [U.S. Forest Products Laboratory, Madison.]

A proposed schedule for the drying of ½-in. Wisconsin Red Oak from 80 to 7% m.c. The time required for the experimental drying was 36 hours. No drying defects developed.

3408. OGURA, T., and OHNUMA, K. [**An experimental formula for the evaporation rate of wood moisture at constant drying rate.**] *J. Jap. Wood Res. Soc.* 1 (1), 1955 (38–41). 8 refs. [Jap.e.] P.R.

The following formula is developed $W' = K(C_o - C')V^{\alpha}x^{\beta-1}\nu^{\gamma}$, where W' is the rate of evaporation (g./ sq. cm./sec.); V, air velocity (cm./sec.); C_o–C', difference between vapour densities on the wood surface and in the air stream; x, length of air travel through the wood; ν, dynamic air viscosity (sq. m./sec.); and K,α,β and γ, are constants.

3409. TERAZAWA, S., and IWASHITA, M. [**Fundamental study on the operation of wood drying. (1). On the characteristic curve in wood drying.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (81–93). 8 refs. [Jap.jap.e.]

Illustrates a bench-scale experimental kiln giving control of temperatures, air speed, and air moisture, and allowing of continued observation of these factors and of the weight of a suspended wood specimen. A blower drives air over a heating

element, past the specimen and into a second chamber, whence the re-heated air, with its moisture replenished, is by-passed back to the blower for re-circulation. The specimens used were of dimensons up to 28 × 274 mm., and were 606 mm. long. Species were (*a*) *Fagus japonica*, (*b*) *F. crenata*, (*c*) *Quercus crispula* and (*d*) *Cercidiphyllum japonicum*, variously of heart- or sapwood, flat- or quarter-sawn. The object of the study was to observe exactly the process of drying schedules. In this study the dry bulb is held at 60° C. and wind velocity at 70 cm./sec. Using species (*a*) for illustration, the drying time is graphed against moisture content (m.c.) when wet-bulb depressions (w.b.d.) are held at 3, 5, 10 . . . 25° C. These w.b.d. curves are then shown with drying rate (loss % m.c./hour) against m.c. From these and similar curves, drying-characteristic curves are derived showing for each specimen the drying rate against w.b.d. Using the general equations

$$z = \frac{1}{k} \log \frac{u_a - u_e}{u - u_e}, \text{ and } \frac{du}{dz} = k(u - u_e),$$

the values for k, z and $\frac{du}{dz}$ are tabulated for each specimen and the theoretical curves for falling m.c. against drying time and rising w.b.d's are then used for a theoretical schedule, the graphs showing a very close correspondence between the theoretical and actual progress of drying. Further work will consider distortion.

3410. LADELL, J. L. **The role of circulation rate in high-temperature drying.** *B.C. Lumberm.* 39 (10–11), 1955 (46 . . . 50; 42, 44, 68, 70). 6 refs.

In experiments with the new kiln at the Ottawa Forest Products Laboratory, the effects of circulation rates of 400, 600 and 900 ft./min. (with the dry bulb held at 240° and the wet at 200° F.) on the uniformity of drying and on degrade in Eastern White Spruce [*Picea glauca*] were studied. Periodical reversal of circulation evens out the temperature drop across the pile. The 400-ft. rate, even with this reversal, resulted in a drop of > 5°, which is considered the maximum allowable in this type of drying. For a pile of this species, 3 ft. wide, under the conditions given, a minimum of 500 ft./min., periodically reversed, was indicated for obtaining reasonably uniform moisture content without resort to long conditioning periods. Studies have also shown that very high circulation rates result in significantly shorter drying times with little risk of degrade and probably more than covering the extra cost requirement in power and heat. It is probable that higher dry- and lower wet-bulb temperatures would hasten drying still further and that these results may be applicable to other softwoods.

3411. RASMUSSEN, E. F., *et al.* **Types of ventilated lumber dry kilns.** *Rep. U.S. For. Prod. Lab., Madison* No. 1900–2, 1955. pp. 30 + 20 photos, 35 dgms. P.R.

Illustrated description of different compartment and progressive kilns, their general construction, and equipment for controlling temperature and relative humidity.

3412. FESSEL, F. Grossraumtrockner. **[Large-capacity kiln.]** *Int. Holzmarkt* 1955 (20), (20–1). [G.]

Describes, with illustrations, a kiln having a capacity of 100 cu.m. and suitable for construction in larger sizes, and discusses the schedules for Spruce and Beech.

3413. CANTRELL, W. R. **Vapor drying of Western woods.** *For. Prod. J.* 6 (1), 1956 (30–4). 7 refs.

Discusses difficulties encountered in the vapour-drying of general-purpose timber, and possible methods of eliminating them. Presents data obtained in drying 11 species of Western [U.S.] woods by this method. Estimated costs of equipment and operating are given. *From author's summary.*

3414. **Dielectric seasoning of wood.** Bremer and Co., Zürich. [*n.d.*] pp. 7. 3 refs. [E.] P.R.

Contains 3 articles: Dielectric seasoning of wood (*H. Kühne*); The economy of the new process (*R. C. Bremer*); and Technological principles of dielectric seasoning (*T. Hafner*). Deals with a method for RF drying, developed and patented by Bremer and Brown, Boveri & Co., the fundamental principle of which is claimed to be a gradual application of controlled dielectric heating, the wood being thus dried from inside in such a manner as to avoid damage or lowering of quality.

3415. UGOLEV, B. N. **[Residual stresses in wood and a method of removing them.]** *Derev. lesohim. Prom.* 2 (1), 1953 (12–5). [Russ.] From *abstr.* in *Holzforschung, Berlin* 9 (1), 1955 (22). [G.] P.R.

In order to determine the stresses present in wood after drying, a piece sawn off the board to be tested is comminuted to chips 4 mm. thick. Results of tests with these chips are graphed and show that, in the outer 10–15 mm. of boards, only compression stresses occur, whereas in the centre of the boards expansion stresses are found. The value of residual stresses decreases towards the end of the drying process. In the 5–13% m.c. range, compression-stress values are 7–32, and expansion-stress values 4–15 kg./sq. cm. Material of this kind undergoes no changes during storage up to 284 days. Residual stresses can be removed by treating the boards with air of a higher temperature (90° C.) and a humidity 4–6% higher [than the air humidity in equilibrium with the ultimate m.c.?] before the wood is discharged from the kiln. The stress equalization is considered to be satisfactory when the stresses are ≯ 1–2 kg./sq. cm.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 2856, 3392.

3416. **'Rapier' super fork truck.** *Timb. Tr. J.* 216 (4143), 1956 (59).

Designed for the handling of long loads (timber, steel section pipes), this truck incorporates a new conception in that the mast is arranged to swivel to one side, enabling the load to be carried in line with the direction of travel as if 'tucked under its arm', thus presenting minimum widths and lengths for

manoeuvring, and cutting out in certain circumstances 3 operations with 3 machines. The truck is powered for hill climbing, has a road speed of 20 m.p.h., can lift and carry 1,000 lb. at 24 in. from the fork's face, and is large enough to load a lorry from one side. (Ransomes & Rapier Ltd., Ipswich.)

3417. **King-size lift truck. Electric log stacker handles truckload of logs at one bite.** *Sth. Lumberm.* 191 (2393), 1955 (226).

The Le Tourneau electric log stacker can handle loads of 28 tons, 8 ft. wide and 9 ft. high. It has all-wheel drive and individual electric motors to power the fork lift, the boomtilt, and the pincer action of the holding 'tusks'.

3418. **New side boom for crawler. 'Little Boomer' will lift loads up to 1600 pounds.** *Sth. Lumberm.* 191 (2393), 1955 (238).

Describes a small, manoeuvrable side boom for the Oliver OC-3 crawler, operated by two hydraulically driven winches, with an optional counterbalance, also operated hydraulically. Its great capacity is ensured through the low centre of gravity of the whole unit.

3419. **Side-loading fork lift truck.** *Sth. Lumberm.* 191 (2393), 1955 (224).

Describes the Traveloader, capable of carrying long lumber in narrow aisles, of stacking it, and of operating as a road vehicle. The 10,000 lb.-capacity model has a lift of 12 ft., a standard fork length of 66½ in., a length of 234 and a width of 96 in., and weighs 18,600 lb.

3420. OSBORNE, M. J., CHESLEY, K. G., WILSON, F. G., MORGAN, J. W., CONNOR, R. Q., and SAINT-LAURENT, W. **Underwater storage of pulpwood.** *Tappi* 39 (3), 1956 (129–39). 1 ref. P.R.

Describes log ponds for underwater storage of pulpwood, built by two big American pulp-manufacturing concerns, and the evolution in engineering design of machines handling pulpwood. The ponds described have capacities of 16,000 and 25,000 cords.

3421. BARNHART, G. L. **Paper-wrapped lumber may be stored out-of-doors.** *Sth. Lumberm.* 191 (2393), 1955 (114–5).

The paper wrap, produced by the Thilmany Pulp and Paper Company of Karikauna, Wis., consists of 2 sheets of strong wet-strength treated creped kraft, double-coat laminated with asphalt.

849. Miscellaneous

See Nos. 3381–2.

85. Grading of Wood and Wood Products

See also No. 3167.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 3202–5, 3271–2, 3306, 3327, 3332.

3422. ERTELD, W., and ACHTERBERG, W. Narbenbildung, Qualitätsdiagnose und Ausformung bei der Rotbuche. **[Occlusion, and diagnosis of quality in Beech in connexion with its conversion.]** *Arch. Forstw.* 3 (7/8), 1954 (577–619). 18 refs. [G.g.]

The external marks, swellings etc., of 23 representative logs from stems 72–145 years old (4 localities) were measured and grid-referenced. The internal characters associated with these marks were then exposed by flat sawing and measured. The external marks measured were (*a*) the angle and (*b*) the height of the parabola-shaped bark corrugation that loops over the occlusion boss, and (*c*) the height and (*d*) the breadth of the occlusion scar. The associated internal characters measured were (*e*) the diameter and (*f*) the length of the occluded snag, (*g*) depth of the occlusion layer, (*h*) branch snag angle and (*j*) extent of snag rot. The examination of these characters (profusely illustrated with photographs and diagrams) and the calculation of the regressions (presented in detail with graphs) leads to the following conclusions: Bark scars in Beech are good indicators for (*e*), (*g*) and (*j*). Most reliable for estimating (*g*) is (*b*). For this (*c*) is not so good and (*a*), relied upon by the old rule of thumb, is difficult to measure; (*e*) is most strongly correlated with (*c*), and (*f*) with (*d*), but in the latter case only moderately; (*h*) decreases with height up the stem and (*e*) increases, as do the number of rotten snags, showing that snag diameter has a greater influence than branch angle on the extent of rot. Occluded snag rot is not detectable from the form of the scar or of the associated corrugation. Swellings occur mainly in the upper bole and indicate thick, long, and thinly occluded snags generally connected with rot and serious degrade. If rot is classified in 3 stages, the most advanced stage is commonest. Bullet and shell-splinter damage are not detectable with certainty from scars. Flat scarred felling damage without occlusion swellings, and flat seal- and crater-like scars are not continued into the wood and indicate no degrade. A table grading the logs indicates the lengths suitable for rotary veneer.

3423. KOEHLER, A. [revised by PAUL, B. H.] **Raised, loosened, torn, chipped, and fuzzy grain in lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. 2044, 1955. pp. 9 + 12 photos. P.R.

Apparent causes and some remedies are suggested for these grain defects. Improper seasoning and storage methods, and improperly maintained woodworking machinery have much effect on the development of raised grain. The fact that the pith side of a board gives more trouble than the bark side in corrugation of the surface and loosening of the annual layers of growth does not seem to be fully recognized by manufacturers. Damage from torn and chipped grain can be reduced by maintaining equipment in the best possible working condition, although some of the damage results from abnormal grain direction and inherent characteristics of the wood. Fuzzy grain in broadleaved species can in most cases be traced to tension wood. *From author's summary.*

3424. SNODGRASS, J. D. **Young-growth Douglas-Fir: is it predisposed to warp?** *For. Prod. J.* 5 (6), 1955 (406–12). 9 refs.

Results of a study designed to determine how large an incidence of warping might be expected in

building scantlings permitted to air-dry virtually free of restraint and to measure the warping magnitudes, showed that the degrade potential due to predisposition to warp is relatively small in young-growth Douglas Fir scantlings. The tendency to twist when they contain material from close to the log centre presents a problem. The magnitude of warp was found to vary linearly with moisture content in the m.c. range 17 to 6%.

853. Grading of Wood in the Rough

See also No. 3422.

3425. HEISKANEN, V. Vuosiluston paksuuden ja sahatukin laadun välisestä riippuvuudesta. [**On the interdependence of annual ring width and sawlog quality.**] *Commun. Inst. for. Fenn.* 44 (5), 1954 (1955). pp. 31. 38 refs. [Fi.e.]

A study of [Pine?] logs and timber in Finnish mills revealed some correlation between mean annual-ring width and log grade—Grade I logs 1·26 mm., Grade II 1·30 mm., and Grade III 1·55. The correlation between log grade and number of rings/8 cm. was rather stronger.

854. Grading of Converted Timber

See also Nos. 3232, 3315, 3352.

3426. SABROE, A. S. Danske standards for savet tømmer og savskaarne lægter. [**Danish standards for sawn timber and laths.**] *Dansk Skovforen. Tidsskr.* 39 (3), 1954 (148–52). [Dan.]

Reproduces and discusses briefly *Dansk Standard* Nos. 146 and 366 (timber and laths respectively), 1953. The standards deal mainly with dimensions, showing both metric and English measurements.

3427. BURGESS, H. J. **Strength grouping of Malayan timbers.** *Malay. Forester* 19 (1), 1956 (33–6).

Groups the common Malayan commercial timbers into four strength groups, and gives recommended working stresses for each group in different working conditions.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 2524, 3112, 3169, 3241 *et seq.*, 3356, 3462.

3428. HASELTON, W. R. **Gas adsorption by wood, pulp, and paper. II. The application of gas adsorption techniques to the study of the area and structure of pulps and the unbonded and bonded area of paper.** *Tappi* 38 (12), 1955 (716–23). 31 refs. P.R.

For part I see *For. Abstr.* 16 (No. 2177).

3429. SCHAFER, E. R., MARTIN, J. S., and KELLER, E. L. **Pulping characteristics of Lake States and Northeastern woods.** *Rep. U.S. For. Prod. Lab., Madison* No. 1675 (rev.) 1955. pp. 20 + 8 tbls. 74 refs. P.R.

Tabulates groundwood, sulphite, sulphate and soda pulping characteristics and the respective pulp and paper properties for broadleaved and coniferous woods of these regions.

3430. BAIRD, P. K., MARTIN, J. S., and FAHEY, D. J. **Bond and magazine book papers and milk-carton paperboard from old-growth Douglas-Fir and Red Alder pulps.** *Rep. U.S. For. Prod. Lab., Madison* No. 2042, 1955. pp. 10 + 3 tbls. 2 refs. P.R.

Experimental processes tried at Madison point to the possibility of commercial application of Douglas-Fir bleached sulphate pulp, with or without Red-Alder pulp (groundwood, chemiground, or neutral sulphite).

3431. SUREWICZ, W. [**Investigations on the utilization of *Pinus contorta* wood in the paper industry.**] *Prace Instytutu celulozowo-papierniczego* [*Poland*] 2 (1), 1953 (26–8). [Pol.] From *abstr.* in *Chem. Zbl.* 126 (22), 1955 (5209). [G.] L.S.

The more quickly growing *P. contorta* yields wood with wider growth rings, higher cellulose and pentosan content, and lower resin and mineral content than *P. sylvestris*.

3432. GLEATON, E. N., and SAYDAH, L. **Fiber dimensions and papermaking properties of the various portions of a tree.** *Tappi* 39 (2), 1956 (157*A*–158*A*). P.R.

Experimental cooks of *Pinus palustris* branch-wood (*A*), stumpwood (*B*), rootwood (*C*), topwood (*D*), and centre-log wood (*E*), gave the following results (tabulated and graphed): the length of fibres decreased in the sequence *B, E, D, C, A*, the width of fibres in the sequence *B, C, D, A, E*; the length/width ratio and the pulp strength increased in the sequence *A, B, C, D, E*.

3433. KAYAMA, T. [**On the pulping of blue-stained Pine wood. The sulphate process.**] *J. Jap. Wood Res. Soc.* 1 (1), 1955 (1–5). 3 refs. [Jap.e.] P.R.

Pinus densiflora wood inoculated with pure cultures of *Ophiostoma ips*, *O. pini*, and *Leptographium* sp. contained more ash, pentosans and lignin, and less extractives and cellulose than sound wood. The quality of pulp was little affected by the blue-stain, but its colour darkened as the degree of blue-stain increased.

3434. YONEZAWA, Y., KIKUCHI, F., MIYAZAKI, K., INOMATA, T., TAKANO, I., and USAMI, K. [**Studies on the production of chemical pulps from Bamboo-grass.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 81, 1955 (95–120). 8 refs. [Jap.e.]

Bamboo-grass, estimated to amount to 50 million tons in the northern section of Japan, comprises several species, but mainly *Sasa kurilensis* and *S. senanensis*. This study covers separately the chemical composition of internode, node, ground tissue, and vascular bundles of a [? composite] sample of the two named species. Detailed tables and numerous graphs with full English titles and legends give the results in the bleachability of the pulps and the characteristics of the papers made after cooking by the soda, sulphate, and neutral

sulphite processes, with all conditions varied. For the last process the impregnation method and recovery data are included. A study is also presented of the papers made from pulps screened to separate the ground-tissue fibres (< 0·5 mm.) from the fraction containing the larger fibres (0·5–1·5 mm.) and then re-mixed with these fractions in varying proportions. Printing papers made without removing these fine fibres should be superior to those derived from wood pulps and such utilization is considered most advantageous.

3435. KITAO, K. **[Studies on the parenchyma cells in hardwood pulps. VI. Degree of polymerization of the cellulose in the broad rays of *Quercus acutissima* Carr. VII. On the parenchyma cells in Birch pulps.]** *Wood Res., Kyoto* No. 14, 1955. (1–14). 10 refs. [Jap.e.]

[Cf. *For. Abstr.* 15 (No. 4320).] VI. Degree of polymerization of broad rays, cut from fresh Oak sapwood, air-dried and powdered, was 2100–2200, and that of wood, excluding broad rays but similarly treated, 2500–2600. VII. Considerable differences were found in the yields, ranging from 1 to 4%, of alcohol/benzene extractives in *Betula tauschii* from different localities in Hokkaido. Amounts seemed to be unaffected by date of felling (1–20 months before extraction), by locality (S. or N. Hokkaido) or by the presence of incipient decay. Slow-grown wood seemed to yield rather larger amounts of extractives. Sulphite pulps from woods rich in extractives appeared to contain more extractives than pulps from woods poor in extractives. Parenchyma cells (illustrated by photomicrographs) were removed by screening from Birch sulphite and kraft pulps, Beech sulphite pulp, and kraft pulp from 15 hardwoods from Yakushima Island. Resin drops, spherical or irregular in shape, were found in parenchyma cells of Birch but not of other species. Fairly close relationships were found between resin contents of Birch pulps and resinous contents of the parenchyma cells. [Photomicrographs and some tables have English legends.] *From author's summary.*

3436. SCHEPP, R. Die Verwertungsmöglichkeiten des Pappelholzes in der Zellstoff- und Papierindustrie. **[Potential uses of Poplar wood in the pulp and paper industries.]** *Abstr.* in *Holz-Zbl.* 82 (30), 1956 (392). [G.]

Contains data on strength properties of unbleached sulphite and sulphate pulps from *Populus tremula* and %s of Poplar pulp usable in paper manufacture. As large-scale use will require special plant, sufficient steady supplies must be assured. Low pulp yield/cu.m. is a drawback, affecting prices.

3437. ANTOLKOVICH, W. *Salix aquatica gigantea 56.* Eine raschwüchsige Weide mit hohem Zellulosegehalt. **[*S. aquatica gigantea 56*, a fast growing Willow with a high cellulose content.]** *Holz-Kurier, Wien* 10 (22), 1955 (6). [G.] From *abstr.* in *Prehl. lesn. Lit.* 6 (10), 1955 (No. 3861). [Cz.] P.R.

Prof. Jansen obtained this variety [hybrid?] in 1948. It is exploitable after 6–7 years. The bark can be used for the manufacture of salicin and tannic acid.

3438. HILF, H. H. Spekulative Holzerzeugung? **[Speculative production of wood?]** *Holz-Zbl.* 82 (5), 1956 (35–6). 15 refs. [G.]

Attacks claims made for the productivity of a Danish hybrid Willow named *Salix aquatica gigantea* clone 56; reports on the good, but not sensational results of 2 years' trials at Reinbek; and warns against exaggerated hopes until more is known about its performance under varying conditions, and until a market for Willow pulpwood is assured.

3439. BHAT, R. V., and KARNIK, M. G. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part 26. Chemical pulps and writing and printing papers from Blue Gum (*Eucalyptus globulus* Labill.).** *Indian For.* 82 (2), 1956 (79–85 + specimen sheet). 4 refs.

Laboratory experiments on the sulphate pulping of Blue Gum (*E. globulus*) from the Nilgiri Hills are described. The average fibre length of the pulp was 1·11 mm. and the average diameter 0·014 mm. Easy-bleaching pulps in good yields were obtained. Printing paper made on the pilot plant was characterized by good formation and satisfactory strength properties. A sample of printing paper is appended. *From authors' summary.*

3440. VALENTE, H. M. Especies subtropicales latifoliadas. Fuente de materia prima para la industria del papel. **[Subtropical hardwood species. A source of raw material for the paper industry.]** *Repr.* from *Asociación Fabricantes de Papel* 2 (22), 1955. pp. [5]. [Span.] [Dirección de Investigaciones Forestales, Administración Nacional de Bosques, Buenos Aires.] P.R.

A preliminary report comparing the anatomical characteristics of conifers and hardwoods, and presenting some data on fibre morphology and wood chemistry of 8 Argentine hardwood species compared with *Araucaria angustifolia.*

3441. ROBERT, T. A. [*sic.*] [TRAYNARD, P., and ROBERT, A.] **Hydrotropic pulping of a tropical wood.** *Tappi* 38 (9), 1955 (149*A*–150*A*). P.R.

Summarizes the results of an investigation carried out in France by Eymery [reference not given] on the delignification of wood by means of concentrated solutions of hydrotropic salts (alkali salts of benzoic, xylene-sulphonic and cymene-sulphonic acid) in a digester at 150° C. for 12 hours. The solution dissolves most of the lignin and can then be used with fresh chip material until it becomes saturated with lignin; the lignin is then precipitated by dilution and the filtrate concentrated to the desired degree and re-used. The crude pulp so obtained must be washed with the hydrotropic solvent. The yield of bleached pulp is higher than that obtained with any other known procedure (53% *vs.* 46% for Poplar). The pulp can be used for viscose manufacture. The authors then describe their investigation on the pulping of *Ilex sebertii*, conducted with a 40% solution of Na benzoate; the unbleached

pulp yield was 43% and the pulp was easily bleachable and beatable; fibres were similar to Fir tracheids. [Cf. *For. Abstr.* 17 (No. 3245).]

3442. MATSUZAKI, K., HATANO, A., TORU, A., and SOBUE, H. **On the state of pentosan in wood pulps.** *Bulletin of the Chemical Society of Japan, Tokyo* 27 (8), 1954 (483–5). 19 refs. [E.e.] L.S.

Pulps from *Pinus densiflora* and *Fagus crenata* were treated with various chemicals. Results (tabulated) show that it is difficult to reduce the pentosan content of the wood pulp below 0·5% by intermicellar reactions such as acid hydrolysis or dilute hot alkaline refining, whereas by intramicellar reactions such as cold concentrated alkaline refining, it is easy to do so.

3443. GUSTAFSSON, C., and SOILA, R. **Condensation of lignins and carbohydrates when heating wood with water at various pH values.** *Pap. ja Puu* 38 (1), 1956 (9–12). 4 refs. [E.e.] P.R.

Pre-extracted wood flour of Spruce and Birch were cooked with water at various pH values in a study of the condensation reactions that affect pulping.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 3032, 3224, 3253, 3331–2, 3335.

3444. **Insulation board manufacture and economics.** *Paper Tr. J.* 139 (51), 1955 (42–6). 1 ref. P.R.

In addition to statistical data on production, prices, imports and exports, includes a discussion on the qualities of insulation board from wood as compared with bagasse.

3445. ELMENDORF, A., KLAUDITZ, W., and LÜHNING, A. **Manufacture of synthetic lumber in Germany.** *Pap. Amer. Soc. mech. Engrs.* No. 55—*A*-190 [1955]. pp. [1] + 8 + 13 photos + 4 dgms. P.R.

Discusses the techniques and machinery developed and used in Germany for the manufacture of chipboards bonded with synthetic resins to produce thick panels.

3446. **Shavings make particle board.** *Lumberm.* 83 (3), 1956 (70–2).

Describes, with illustrations, the processes and equipment used in manufacturing a new building board, 'Rezwood', from planer shavings. It is denser than normal wood, has better insulating and acoustic properties, good nailability and a deflection $\frac{1}{8}$–$\frac{1}{10}$ that of plywood of the same thickness. Data on physical properties are tabulated.

3447. ZIELIŃSKI, R. Płyty wiórowe na lepiszczu syntetycznym. **[Particle boards with synthetic binders.]** *Materiały Budowlane [Poland]* 9 (5), 1954 (126–30). [Pol.] From *abstr.* in *Referat. Ž.* (*Him.*) 1955 (12), (No. 25091). [Russ.] P.O.

Particle boards are classified in Poland as follows: light-weight (1A), density 400 kg./cu.m.; medium-heavy (1B), 400–850 kg./cu.m., used in structural work and furniture; heavy-weight (1C), and special (1D), > 850 kg./cu.m. Their technical properties depend chiefly on the nature and proportion of the resin binder, the pressure used, and the form and size of the wood particles, and very little on the species of wood. The tensile strength of the four types is—3–10, 15–200, 40–250, and 120–280 kg./sq. cm.; and their bending strength—10–100, 25–500, 70–700, and 150–1500 kg./sq. cm., respectively. The particles are first seasoned down to 8–20% moisture content, mixed (often in ball mills) with ca. 8% by weight of 50–70% urea-formaldehyde resin or ca. 10% of phenolic resin, and pressed at 2–7, 7–25, and 25–70 kg./sq. cm. for 1A, 1B and 1C, respectively. Boards tested at the Polish Institute of Building Technology, containing 10% phenolic resin, were pressed at 15 kg./sq. cm. and 110° C. (H.F. heating 7–8 min. for 2-cm. boards), and had a bending strength of 450 kg./sq. cm.

3448. KARNEEV, G. M. Voloknistye plastičeskie massy iz drevesnyh othodov i ih primenenie dlja izgotovlenija derevoplit, izoljacionnyh plit i taromaterialov. **[Plastic fibrous masses from wood waste and their use in the manufacture of building boards, insulation boards, and packing materials.]** *Trudy Naučno-issledovateljskoĭ Laboratorii Tary* 1954 (1), (15–29). [Russ.] From abstr. in *Referat. Ž.* (*Him.*) 1955 (9), (No. 17647). [Russ.] P.O.

Water-resistant board for containers can be made from sawdust by using as binder not only phenol-formaldehyde or urea resins, but also sulphite liquor, with oxalic acid as tanning agent. Shavings and chips are used for the manufacture of insulation and building boards. The dry method of making such boards has two variants: (1) the prepared mix of comminuted waste plus the binder is filled into moulds, compressed and conveyed to driers for setting; (2) the prepared mix [with binder?] is pressed between the hot plates of a hydraulic press, and left there for 5–10 min. The presses and the whole process of manufacture are described.

3449. MAKU, T., and HAMADA, R. **Studies on chipboard. Part 1. Mechanical properties. Part 2. Swelling properties of chipboard.** *Wood Res., Kyoto* No. 15, 1955 (38–59). 6 refs. [E.e.jap.]

3450. KITAHARA, K., and KASAGI, K. **[Effects of raw chip dimensions on the physical and mechanical properties of chipboard.]** *Wood Ind., Tokyo* 10 (8), 1955 (406–12). 2 refs. [Jap.e.] P.R.

Chipboards were made from chips of 4 different sizes, the largest being 3 × 9 × 45 mm. and the smallest 0·33 × 1·0 × 5·0 mm. The appearance of the face and cross-section surfaces of the boards are shown in photographs, and moisture content, thickness after pressing, air- and oven-dry densities, absorbed moisture and swelling, in water and at 95% r.h., Young's modulus and modulus of rupture, compression and tensile strength, impact bending strength, and Brinell hardness, in graphs and tables with English legends. With increasing chip size there were increases in thickness, thickness recovery after pressing, moisture absorption at 95% r.h., and water absorption and swelling in water, and decreases in density, swelling at 95% r.h., Young's modulus and modulus of rupture, compression, tensile and impact bending strengths and Brinell hardness.

3451. KITAHARA, K. **[Relationship between the conditions of hot pressing and the physical and mechanical properties of chipboards.]** *J. Jap. Wood Res. Soc.* 1 (1), 1955 (17–20). 1 ref. [Jap.e.] P.R.

Chipboard mixes made of 50/50 *Picea jezoensis* and *Abies sachalinensis*, with 11% urea resin plus hardener, initial moisture content 19%, were subjected to pressing at different pressures and temperatures. At low temperatures ($\not>$ 150° C.) and with short pressing periods (ca. 10 min.), chip springback caused an increase of thickness above that of the distance piece; conversely, at higher temperatures and higher pressures, the thickness after pressing was less than that of the distance piece, owing to shrinkage. Decomposition at higher temperatures causes a decrease of density; for temperatures of 140° and 180°, the density first increases and then decreases as the pressing time increases. Other properties have also been studied.

3452. AIRSCREW COMPANY AND JICWOOD LTD. and LYNAM, F. C. **A process for the production of proofed composite board.** *Brit. Patent* No. 713,834, Aug. 18, 1954. pp. 3. P.O.

A composite board obtained by impregnating the comminuted wood with a suitable insecticide solution, drying and adding the binder, or by adding the liquid binder and applying the mixture to comminuted wood.

3453. **Standard specification for wood-fibre building board.** *S. Afr. Bur. Stand. Specif.* No. 540, 1955. pp. 10 + 10. [E.Afrik.] Price 5*s*. P.R.

3454. PACKMAN, D. F. **The production of hardboard from tropical timbers. III. African Pencil Cedar (*Juniperus procera* Hochst.).** *Colon. Plant Anim. Prod.* 5 (2), 1955 (137–49 + 2 photos). 1 ref.

[Cf. *For. Abstr.* 16 (No. 4775); 17 (No. 1018).] Boards, which met the requirements of B.S. 1142 (1953) ('*Fibre Building Boards*') for super hardboard, were made on an experimental scale from both mature heartwood [h.w.] and young sapwood [s.w.] of African Pencil Cedar by a simple process involving steaming the wood in the form of chips, followed by defibration and refining in a disc mill to produce a pulp, which was then hot pressed in the usual way. The boards from h.w. had particularly good properties of water resistance while those from s.w. required some treatment, such as tempering, to reduce their absorptivity to an acceptable level. Boards requiring no heat tempering or similar treatment could probably be made from mixtures of h.w. and s.w. in which the % of h.w. was $\not<$ 50. Satisfactory boards were made also from h.w. from which practically all the natural oil had been removed by ether extraction. These met requirements for super hardboard without any heat treatment or sizing. Boards made from h.w. either unextracted or extracted with ether, were completely resistant to fungal decay under standard testing conditions, while those made from s.w. were heavily attacked. Unextracted h.w. boards also possessed a high degree of resistance to attack by two species of wood-destroying termites, while boards made from ether-extracted h.w. were rather more susceptible to attack, but were much superior to the boards from s.w.

The results indicate that it should prove possible first to recover oil, which has commercial value, by means of solvents or steam distillation, and, then produce, from the residual wood, super hardboard having high qualities of strength, dimensional stability, and durability under tropical service conditions. *From author's summary.*

3455. ANDERSON, B. E., and CLARK, J. D'A. **A new air-felting process for making tissues, batts, and boards.** *Tappi* 39 (1), 1956 (1–4). P.R.

Fibrous sheets (tissues, non-woven fabrics, fibrous batts or fibreboards) are made by depositing fibres (paper-making fibres, Redwood bark, wool and Dacron shearing and napper wastes, second-cut linters, and reclaimed tyre cord waste) from air suspension. Bonding agents or thermoplastic fibres can be added to the air-laid webs. The process is claimed to have special advantages for fibres $\frac{3}{8}$–$\frac{3}{4}$ in. long, i.e. too long for wet processes and too short for textile processes. The method, which is described and illustrated, can be applied to the manufacture of stencil bases, filters, fibreboards, and preforms.

3456. MANNHEIM, C. P. **Method of impregnating fiber insulation board.** *U.S. Patent* 2,702,761, Feb. 22, 1955. pp. 3 + 3 dgms. 5 refs. P.O.

The porous sheet is heated differentially and immersed in hot thermoplastic saturant, thus yielding different degrees of saturation.

3457. NILSSON, H., and ALBINSSON, A. (to Spånitbolaget Torstensson and Co.). Förfaringssätt för behandling av träavfall jämte sålunda behandlat träavfall. **[Method of treating woodwaste, and the woodwaste so treated.]** *Swedish Patent* No. 140,063, April 21, 1953. pp. 2. [Sw.] P.O.

Sawdust and shavings are first treated with dilute H_2SO_4, and then shaped to boards, using a hydraulic cement.

3458. GEWECKE, H. Procédé pour la fabrication de poteaux imprégnés à coeur pour lignes électriques. **[Method of manufacturing poles for power transmission, impregnated throughout.]** *French Patent* No. 1,070,771, Aug. 12, 1954. pp. 2. [F.] P.O.

Wood is first chipped or defibrated, the chips or fibres are impregnated with fungicides and suitable binders, and formed to poles by applying pressure and heat.

863. Wood Hydrolysis. Saccharification

3459. WALLACE, L. C. (to S. M. Nickey, W. J. Eason, L. D. Kellogg, and U.S. Steel Corporation). **Method and apparatus for hydrolyzing cellulosic materials.** *U.S. Patent* No. 2,681,871, June 22, 1954. pp. 6 + 7 dgms. 9 refs. P.O.

The method consists in continuously bringing together under a pressure of $>$ 1 atm., cellulosic materials e.g. sawdust, in countercurrent flow with a dilute acid and steam, the sugar and volatile products being removed continuously near the point of entry of cellulosic materials, and lignin being removed continuously near the point of entry of acid and steam.

3460. GABELLINI, E. B. E. Sacarificação de resíduos florestais. **[Saccharification of forest residues.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (260–76). 15 refs. [Port.e.]

Briefly reviews various methods of wood saccharification and presents a short account of experimental work with *Araucaria angustifolia* at the Instituto de Biologia e Pesquisas Tecnológicas do Paraná.

3461. ODINCOVS, P., and BEINARTS, I. **Hydrolysis of Birch hemicellulose with concentrated sulphuric acid.** *Latvijas PSR Zinātnu Akademijas Vēstis, Riga* 1955 (5), (15–30). [Russ.latv.] From *abstr.* in *Chem. Abstr.* 50 (1), 1956 (563). P.R.

Birch sawdust containing 26·4% hemicellulose (*A*) pre-extracted with ethanol/C_6H_6 was hydrolysed with 50–60% H_2SO_4 at 30–50° C. The rate of hydrolysis changed as the hydrolysis progressed, exhibiting a maximum and a minimum on account of the non-homogeneous distribution of (*A*) in the wood. The rate increased with temperature and with H_2SO_4 concentration. Saccharification of the non-separated (*A*) by H_2SO_4 of medium concentration did not follow first-order kinetics. A part of the lignin is soluble in H_2SO_4; this accelerated the attack on pentosans, so that the hydrolysis of Birch pentosans was faster than that of Fir [Scots Pine?].

864. Utilization of Lignin

3462. GATTORTA, G., and PALLOTTA, U. Possibilità di utilizzazione del ligninsulfonati di calcio e di ammonio preparati dai liscivi solfitici dell'industria cartaria. **[Possible utilization of Ca and NH_4 lignin-sulphonates derived from sulphite waste liquors.]** *Ann. Sper. agr.* (*n.s.*) 10 (1), 1956 (187–94). 13 refs. [It.it.e.] C.G.B.

Experiments have shown that Ca lignin-sulphonate has a remarkable reconditioning effect on soils of poor structure. NH_4 lignin-sulphonate has a weaker effect. The simple procedure by which Ca lignin-sulphonate is obtained in the laboratory gives reason to suppose that it could be obtained on a large scale at a low price, for use as a soil conditioner. *From authors' summary.*

866. Utilization of Wood Extractives

See also Nos. 2829–30.

3463. KISSIN, I. A indústria do pau rosa. **[The Rosewood [oil] industry.]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 5, 1952 (214–30). [Port.e.]

A brief survey of the essential oil industry in Brazil, based on *Aniba duckei*.

3464. NAVES, Y.-R. Études sur les matières végétales volatiles CXXXIX (1). Contribution à l'étude des sesquiterpènes de l'huile essentielle de bois de rose du Brésil (*Aniba rosaeodora* var. *amazonica* A. Ducke). **[Studies on plant volatile substances CXXXIX (1). The sesquiterpenes of the essential oil from *A. rosaeodora* var. *amazonica* (*A. duckei*).]** *Bull. Soc. chim. France* 1956 (2), (292–7). 38 refs. [F.] O.R.S.

867. Destructive Distillation

3465. TROXELL, H. E., and BARNEY, C. W. **The Colorado experimental charcoal kiln.** *Res. Note Colo. Sch. For. Range Mgmt.* No. 3, 1956. pp. 2.

A kiln made of concrete building blocks, similar to the Connecticut kiln [cf. *For. Abstr.* 8 (No. 1990)] but with certain minor changes to increase its service life.

3466. ARIES, R. S. **Charcoal manufacture in small continuous retorts.** *Sth. Lumberm.* 192 (2394), 1956 (39–40).

Describes the principle of the installations, their construction, operation, labour requirements, yields etc. Low-cost wood, green or dry, such as slabs or edgings, can be used. By-products are not utilized, but their production by charcoal distillation is no longer economic in industrialized countries.

3467. SETTEN, G. G. K. **The yield of Mangrove charcoal obtained from kilns in Kedah and Perak, Federation of Malaya.** *Res. Pamphl. For. Res. Inst. Kepong* No. 17, 1955. pp. 13 + 2 gphs. 6 refs.

Data are given on yields from *Rhizophora conjugata, R. mucronata, Bruguiera gymnorrhiza, B. eriopetala* and *B. parviflora*. Conversion factors based on weight of firewood have been found unsatisfactory and factors using volume of firewood are to be preferred. In some areas there is a tendency for the larger kilns to be less efficient than the smaller ones, and among kilns of the same size the efficiency of the burn tends to decrease as the load of firewood is increased. Under the conditions of species mixture, % of barked logs, and moisture content, which rule at Matang kiln sites, the average yield of charcoal is 23·87% by weight of the total weight of firewood.

3468. CEĬTLIN, L. I. Briketirovanie drevesnougoljnoĭ meloči. **[Briquetting of charcoal breeze.]** *Derev. lesohim. Prom.* 3 (3), 1954 (17–8). [Russ.] From *abstr.* in *Referat. Ž.* (*Him*) 1955 (1), (No. 1327). [Russ.] P.O.

Charcoal is finely ground (> 80% below 0·25 mm.), mixed with 30% by weight of tars and 20–25% of water, compressed at 75–100 kg./sq. cm., dried at 120–150° and fired at 400–450° C.

3469. SPITZNER, F., and CHICARELLO, P. A destilação sêca dos resíduos do pinheiro. **[Dry distillation of *Araucaria angustifolia* wastes]** *An. bras. Econ. flor., Inst. nac. Pinho* No. 7, 1954 (387–98). [Port.e.] [Instituto de Biologia e Pesquisas Tecnológicas do Estado do Paraná.]

Summarizes the results of studies over more than 10 years. Details are given of an installation simple enough to be put in a sawmill. Experiments indicate that 1 cu.m. of branches can yield 120 kg. of high-quality vegetable charcoal, 17 kg. of Ca acetate corresponding to 10 kg. of 80% acetic acid, 20 kg. of crude tar and 3·5 kg. of crude methylene.

3470. SUMAROKOV, V. P., and VOLODUCKAJA, S. M. **[Commercial-grade furfural obtained from the furfural oils of wood pyrolysis.]** *Derev. lesohim. Prom.* 3 (2), 1954 (10–2). [Russ.] From *abstr.* in *Holzforschung, Berlin* 9 (1), 1955 (24). [G.] P.R.

Furfural oils obtained as waste products from wood pyrolysis contain 60–80% furfural. Suitable vacuum fractionation (intermittent at 12 mm. Hg, continuously at 100 mm. Hg) results in 94% commercial furfural in a yield of up to 65%.

3471. SILIŠČENSKAJA, N. M. Novyĭ metod opredelenija kačestva drevesnosmoljnyh antiokisliteleĭ. **[A new method of determining the quality of wood-tar antioxidants.]** *Gidrol. lesohim. Prom.* 8 (2), 1955 (14–5). 4 refs. [Russ.] P.R.

Phenols with OH groups in ortho were more effective as petrol antioxidants than those with OH groups in other positions. Owing to the greater polyhydroxybenzene content, the higher-boiling (above 240° C.) wood-tar fractions were more effective than the lower-boiling ones.

89. Other ('Minor') Forest Products

See also No. 3174.

892. Vegetable Products

See also Nos. 2495, 2504, 3354.

892.1. Grass. Litter. Leaf Fodder etc.

3472. PANDYA, P. S. **A note on utilizing Mangrove vegetation for preparation of compost.** *Poona Agricultural College Magazine, Poona* 45 (2), 1954 (68). L.S.

In trials at the Agricultural Research Station, Ratnagiri, whole Mangrove plants, or leaves and twigs, or leaves only, were put into covered pits, either alone or with alternating layers of ash and cow-dung. Decomposition took from 26 months for whole shrubs to 12 months for leaves only. N content of the compost ranged from 1·31 to 2·32%. Where no transport or collection costs arize such compost could form a useful organic fertilizer.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 2516, 2847, 3356–9, 3437, 3498.

3473. PEARMAN, R. W. **Tanning materials of the British Commonwealth: Mangrove bark.** *Colon. Plant Anim. Prod.* 5 (2), 1955 (96–118). 18 refs.

A general account of the tannin content of the barks is followed by separate accounts of the production of Mangrove bark in Kenya, Tanganyika, Zanzibar, Seychelles, British West Africa, British West Indies, Fiji, Borneo, Malaya, Australia and India; and tanning properties and chemistry of Mangrove extracts.

3474. **Goran (*Ceriops roxburghiana*) bark.** *Rep. For. Adm. W. Bengal 1951/52*, 1955 (29–30).

Experiments were made, using both wooden and iron implements, and large and small trees, to see whether methods of collection had any effect on the undesirable red colour imparted to leather by tanning with Goran bark. The colour was found to be predominantly red, irrespective of methods of collection, and average tannin content of bark was lower than previous figures. [Cf. *For. Abstr.* 17 (No. 2254).]

3475. PUTNAM, R. C., and BOWLES, A. V. **Vegetable tannins. XI. Mangrove.** *Journal of the American Leather Chemists' Association, Easton, Pa.* 50 (1), 1955 (42–6). 2 refs. P.O.

Degradation of purified Mangrove tannin yielded phloroglucinol and protocatechuic acid.

3476. PUTNAM, R. C., and BROWNE, W. R. **Vegetable tannins. XII. Chestnut. [*Castanea dentata.*]** *Journal of the American Leather Chemists' Association, Easton, Pa.* 50 (2), 1955 (64–84). 55 refs. P.O.

Presents results of chemical and spectroscopical analysis of the tannin.

3477. PUTNAM, R. C., O'GORMAN, V., and BOWLES, A. V. **Vegetable tannins. XIII. Acetyl values.** *Journal of the American Leather Chemists' Association, Easton, Pa.* 50 (3), 1955 (149–52). 7 refs. P.O.

Acetylation of Quebracho tannin with radioactive acetyl chloride permits highly accurate determination of the acetyl value.

3478. CHOWDARY, P. S., JOSEPH, K. A., and PADMANABHAN, K. ***Soymida febrifuga* bark as a suitable substitute for imported Wattle bark.** *Tanner, Bombay* 10 (4), 1955 (15–21). From *abstr.* in *Chem. Abstr.* 50 (2), 1956 (1345). P.R.

Tannin content and properties are dealt with.

3479. ŻURAKOWSKI, M., and WIŚNIEWSKI, W. Wpływ okresu pozyskiwania kory modrzewiowej, daglezjowej i czeremchy amerykańskiej na ilość garbników. **[Effect of the time of bark harvesting on the proportion of tannins obtained from Larch, Douglas Fir and American Bird-Cherry barks.]** *Przegląd Skórzany, Warszawa* 1955 (2), (1–3). [Pol.] From *abstr.* in *Polish tech. Abstr.* 1955 (3), (No. 3724). [E.] P.R.

(1) From *Pseudotsuga taxifolia* up to 40 years old, the bark may be harvested in spring, summer or winter; in older trees the harvesting season is immaterial. (2) From *Larix decidua* over 40 years old the bark should be harvested in spring and summer; with younger trees the season is immaterial. (3) Bark of American Bird Cherry [*Prunus serotina*?] should be harvested only in summer. Bark of (1) and (2) is comparable to Spruce bark as a source of tannin, while that of (3) is poorer than Oak bark.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also Nos. 2853, 3497.

3480. WANDOKANTY, F., KOCÓR, M., UTZIG, J., and MAŁANOWICZOWA, M. Ciała hamujące mitozę zawarte w żagwi brzozowej, *Polyporus betulinus.* **[Mitosis inhibitors contained in *P. betulinus.*]** *Medycyna Weterynaryjna, Warszawa* 10 (5), 1954 (289–90). [Pol.] W.A.H.

The germination of onion, wheat, pea and bean seeds was completely inhibited by treatment with aqueous extracts of *P. betulinus.*

3481. WANDOKANTY, F., UTZIG, J., and KOTZ, J. Wpływ hydrolizatów z żagwi brzozowej, *Polyporus*

betulinus, i guza brzozowego, *Poria obliqua*, na komórki nowotworów złośliwych. **[Effect of hydrolysates obtained from *P. betulinus* and *P. obliqua* on the cells of malignant tumours.]** *Medycyna Weterynaryjna, Warszawa* 10 (10), 1954 (603–5). 4 refs. [Pol.pol.] W.A.H.

Describes a case history of a bitch with *adenocarcinoma mammae*. A considerable recession was observed after a 3-months' oral treatment with hydrolysates of the two fungi.

3482. KREITMAIR, H. *Juniperus communis*—der Wacholder. **[*J. communis*.]** *Pharmazie, Berlin* 8 (2), 1953 (187–92). 35 refs. [G.] L.S.

A general article on the pharmaceutical and toxic properties of the berries and their derivatives.

3483. STANKOVIĆ, S. Č., and SENIĆ, R. Uticaj nekih spoljnih faktora na kvantitativne promene askorbinske kiseline u četinama crnog bora (*Pinus nigra*) za vreme lagerovanja. **[Effect of some external factors on the variation of ascorbic acid content in *P. nigra* needles during storage.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (157–75). 23 refs. [Croat.croat.e.]

3484. STANKOVIĆ, S. Č., and SENIĆ, R. O kvantitativnim promenama eteričnog ulja i *l*-askorbinske kiseline u četinama belog (*Pinus sylvestris* L.) i crnog bora (*Pinus nigra* Arn.) u toku godine. **[Seasonal variations in the content of essential oil [, carotene] and *l*-ascorbic acid in the needles of *P. sylvestris* and *P. nigra*.]** *Glasn. šum. Fak., Beograd* No. 8, 1954 (291–312). 29 refs. [Serb.serb.e.]

Results of chemical analyses show that the content (in mg./100 g. of dry substance) of essential oil, *l*-ascorbic acid, and carotene in Pine needles (means over the whole year, old and young needles taken together) is: (1) for *Pinus sylvestris* 500–920 (mean 800); 63·1–182·0 (mean 125·0); 24·9–50·2 (mean 36·0; (2) for *P. nigra* 600–890 (mean 700); 29·0–83·6 (mean 52·0); 22·3–36·7 (mean 28·0). Seasonal variations in the proportion and refractive index of the essential oil (from old and young needles separately) are graphed and compared with data obtained by other authors [cf. *For. Abstr.* 7 (No. 1370); and V. S. Vasečkin, Technology of wood extractives, Moscow, 1944, p. 366]. Young needles are poorer in carotene and *l*-ascorbic acid than old needles; the same is true for essential oil in *P. nigra*; for *P. sylvestris* further tests are required.

3485. STANKOVIĆ, S. Č., and KARAPANDŽIĆ, D. Kvantitativne promene hlorofila, ksantofila i karotina u četinama belog bora (*Pinus sylvestris* L.) u toku godine. **[Quantitative seasonal variations in the chlorophyll, xanthophyll and carotene [content of] *P. sylvestris* needles.]** *Glasn. šum. Fak., Beograd* No. 7, 1954 (143–56). 26 refs. [Croat.croat.e.]

3486. HEINE, E. W. Beiträge zur Kenntnis der Inhaltsstoffe der Aceraceen. Über die Rinde von *Acer platanoides* L. **[Chemical constituents of Aceraceae: the bark of *A. platanoides*.]** *Pharmazie, Berlin* 8 (11), 1953 (954–62). 56 refs. [G.g.] L.S.

A general survey of the literature, particularly as regards the composition of the bark of various *Acer* species, and an account of the author's own analysis of the bark from young *A. platanoides* stems collected in April. This revealed, for the first time, the presence of saponin.

3487. KREITMAIR, H. *Betula alba*—die Weissbirke. **[*B. alba*.]** *Pharmazie, Berlin* 8 (6), 1953 (534–6). 36 refs. [G.] L.S.

A general article on the therapeutic properties of sap and leaves, and on their chemical composition.

3488. TREASE, G. E., and KULKARNI, J. D. **Pharmacognosy of *Aspidosperma* barks of British Guiana. I.** *Journal of Pharmacy and Pharmacology, London* 7 (7), 1955 (463–72). 16 refs. P.O.

Records the pharmacognostic characteristics of *A. ulei, A. album, A. megalocarpon, A. excelsum* and *A. oblongum*.

3489. FIEDLER, U., and HILDEBRAND, G. Aminopurine aus *Aesculus hippocastanum*. **[Aminopurines from *A. hippocastanum*.]** *Arzneimittel-Forschung, Aulendorf* 5 (8), 1955 (447–53). 15 refs. [G.g.e.] P.O.

Adenine, adenosine, guanine and uric acid were isolated from seeds, flowers and leaves.

3490. SCHULTES, R. E. El curioso rapé 'Ya-kee' del oriente de Colombia. **[The strange snuff 'Ya-kee' from eastern Colombia.]** *Agric. trop., Bogotá* 11 (4), 1955 (329–35). [Span.] A.P.B.

Species used to produce this narcotic are *Virola calophylla, V. calophylloidea* and other *Virola* species. Notes are given on the native preparation and uses of the narcotic and on the identification and sources of other preparations of a similar character.

3491. MCKENNIS, H., JR., HEARST, P. J., DRISKO, R. W., ROE, T., JR., and ALUMBAUGH, R. L. **Isolation of a tetramethoxylated alkaloid from Demerara Greenheart.** *J. Amer. chem. Soc.* 78 (1), 1956 (245–8). 45 refs. O.R.S.

Alkaloids from the bark of *Ocotea rodiaei* yielded a new crystalline derivative, rodiasine dimethiodide, after treatment with MeI. A tentative formula is proposed.

3492. EASTWOOD, F. W., HUGHES, G. K., and RITCHIE, E. **Alkaloids of the Australian Rutaceae. *Evodia xanthoxyloides* F. Muell. V. A note on the constitution of evodiline. With X-ray study, by R. M. Curtis.** *Aust. J. Chem.* 8 (4), 1955 (552—5). 10 refs. O.R.S.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 2828, 3484.

3493. DAVILA OLIVO, G. Economía forestal. El caucho, el balata, el chicle y la sarrapia como productores de materias primas básicas en Venezuela. **[Forest economics. Rubber, balata, chicle and tonka bean as basic raw materials in Venezuela.]** *Bol. Ingen. for. Univ. Los Andes* 2 (9), 1955 (7–70). 19 refs. [Span.]

Surveys briefly the industry in these 4 products, production in Venezuela, exports, imports, domestic

consumption and legal aspects, and makes some suggestions for future Venezuelan policy in these industries.

3494. BARDYŠEV, I. I., and GUSAKOVA, M. V. Insekticidy iz skipidara. **[Insecticides from turpentine.]** *Gidrol. lesohim. Prom.* 8 (8), 1955 (14–5). 6 refs. [Russ.] P.R.

In 1950–52 the Soviet Institute of Scientific Research on Fertilizers, Insecticides and Fungicides developed 'Hlorten' (*A*), a product of photochemical chlorination of hydrochlorinated turpentine (or pure bornyl chloride) in CCl_4 solution, and (*B*) 'Geksaten', obtained identically but in C_6H_6 solution. Some physical properties of both products are given. (*B*) is said to be a solution of BHC in (*A*). The toxicity of (*A*) is claimed to be roughly equal to that of DDT, whereas (*B*) is more toxic than (*A*) or BHC. In 1953, the Central Scientific Research Institute of the Wood Chemical Industry began systematic studies on the possibility of making insecticides from terpenes. The most effective evolved so far are (against Curculionidae) the chlorinated camphene (Hlorfen), and the chlorinated pinene (Hlorten-2). The chlorination was conducted both photochemically and in darkness. Chlorination products of Δ^3-carene are not toxic.

3495. KIRÁLY, G. Fenyötüböl illóolaj. **[Essential oil from conifer needles.]** *Erdö* 4 (3), 1955 (138–41). [Hu.]

Fresh needles cut from felled conifers were chopped fine, fed into a still of 1000-kg. capacity and steam treated at 100–110° C. for 2–2½ hours. The distillate was clarified to a green colour by filtration through paper and, if necessary, redistilled, producing a limpid oil. Except for the low-yielding Spruce, yields average 0·22–0·45% of oil containing 2–5% bornyl acetate (b.p. 160°), a superior quality being obtained from Scots Pine. The solid residue is utilized as a fuel of good calorific value and experiments are in progress with a view to extracting the resin, amounting to 6–8% of the residue.

3496. KARIYONE, T., and ISOI, K. **[Studies on plant waxes, VII. Estolides of Hinoki leaf wax (2).]** *Journal of the Pharmaceutical Society of Japan, Tokyo* 75 (3), 1955 (316–7). 5 refs. [Jap.e.] L.S.

The leaf wax of *Chamaecyparis obtusa* was found to contain palmitic and thapsic acids as its acid estolide component. Their presence with juniperic acid appears to confirm theories on their biogenesis proposed by Verkade and van der Lee. *From authors' summary.*

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

3497. MILLER, C. D., MURAI, M., and PEN, F. **The use of Pandanus fruit as a food in Micronesia.** *Pacif. Sci.* 10 (1), 1956 (3–16). 21 refs. E.M.B.

Notes on the fruit and its uses as a source of edible paste, with the results of chemical analyses of two native varieties.

3498. KLERK, J. C. DE. **Vegetable fibres.** *Sci. Bull. Dep. Agric. S. Afr.* No. 342, 1955. pp. 55. Many refs.

The main part consists of information in tabular form, from world literature and from correspondence, on over 500 fibre plants, giving botanical name, commercial name, geographical sources and uses, and the source of information. There is also a list of common names with botanical counterparts and information on extraction processes for the more important species. Trees listed include *Adansonia digitata*, *Antiaris* spp., *Brachystegia* spp., *Ficus* spp., *Sequoia sempervirens* and *Tilia* spp.

892.8. Heather. Broom, etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See also Nos. 3437–8.

3499. **[*Ischnosiphon arouma* as a minor forest product.]** *Rep. For. Dep. Trin. Tob. 1954*, 1955 (21).

Tirite (*I. arouma*) finds a ready market in Trinidad. The stems are used to make baskets, especially those in which clonal Cacao plants are raised. The Tirite takes about 4 years to reach maturity after being cut back, and the spread of the shelterwood system is encouraging its growth on sandy soils as an understorey in the forest.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

See also Nos. 3158, 3548.

3500. Politique forestière—rapports nationaux annuels. **[Forest policy—national progress reports.]** [*Docum.*] *8th Sess. FAO European For. Comm., Rome 1955*, Nos. *FAO/EFC*/81–*O* and 81–*S*, 1955. [F.] Limited distribution.

Reports for Spain (pp. 5) and Italy (pp. 7).

3501. Rapport du Gouvernement italien à l'Assemblée générale des Nations Unies sur l'administration de tutelle de la Somalie. **[Report by the Italian government to the General Assembly of the United Nations on its administration in Somalia.]** Ministère des Affaires Étrangères, Rome. 1954. pp. 367 + photos, maps and gphs. [F.]

Contains a short section (pp. 106–7) on forests: comprising a description, and notes on legislation and products.

3502. **[Reports on forest policy—Latin America.]** [*Docum.*] *5th Sess. FAO Latin Amer. For. Comm., Caracas 1955*, Nos. *FAO/LAFC*–55/5–8, 11–18, 1955. [Span., Port. or.F.] Limited distribution.

(5–8): Argentina (pp. 59), Ecuador (pp. 6), Panama (pp. 10), Haiti (pp. 11). (11–18): Republic of Honduras (pp. 5), Brazil (pp. 9), Guatemala (pp. 9),

Paraguay (pp. 3), Peru (pp. 3), Chile (pp. 11), Colombia (pp. 4), Venezuela (pp. 4).

902. History of Forests and Forestry

See also Nos. 2594, 2597, 2755, 3146, 3530.

3503. CATHARINO CARDOSO, N. Subsídios para a história dos Serviços Florestais e Aquícolas (1271 a 7 de Maio de 1918). A–Z. **[Contributions to a history of the Services governing Forests and Waters (1271 to 7th May, 1918). A-Z.]** *Estud. Inform. Serv. flor. aqüíc. Portugal* No. 59–F1, 1955. pp. 83. [Port.] Limited distribution.

The main facts relating to the history of the administration of forests and waters in Portugal between the years 1271 and 1918 are set out in note form under alphabetically arranged headings.

3504. **[Slovenian forestry from 1945 to 1954.]** *Gozd. Vestn.* 13 (9/10), 1955 (257–370). Many refs. [Sloven.g.f.]

A special number containing the following articles and papers: (1) Ten years of forestry in the new epoch (*F. Sevnik*); (2) Forest stocks in Slovenia (*A. Svetličič*); (3) Forest management in the period 1945–54 (*R. Pipan*); (4) Forest raising in the first post-war decade (*V. Beltram*); (5) Forest utilization in the decade, 1945–54 (*Z. Turk*); (6) Forest protection in post-war Slovenia (*J. Šlander*); (7) Torrent control in the period 1945–54 (*J. Seljak*); (8) Game in Slovenia (*M. Šušteršič*); and (9) Slovenian forestry schools in the new Jugoslavia (*F. Sgerm*), with a history of forestry education from 1868 to 1955.

3505. **[A tabulated year-by-year record of Japanese forestry development, from 1868 [to 1945 inclusive].]** *For.* [*industr.*] *Econ., Tokyo* 9 (1), 1956 (37–48). [Jap.]

Subdivided each year into General topics, Economic and Financial, Administrative and Legal.

903. Forest Policy, General

See also No. 2635.

3506. **Questionnaire of the Forest Policy Committee Hyderabad with foreword and explanatory notes.** Forest Policy Committee, Hyderabad. 1956. pp. 209 + 6 maps + 3 photos, 3 gphs.

In addition to 90 questions with notes, there is a general account of forest conditions in Hyderabad and 4 appendixes—Grazing Rules, Game Regulations, Wild Animals and Wild Birds Protection Bill, and Abnus [*Diospyros melanoxylon*] Leaves Bill.

904. General Regional Accounts of Forests and Forestry

See also No. 2365.

3507. Die Forstwirtschaft in der Sowjet-Zone. **[Forestry in the Soviet Zone [of Germany].]** *Denkschriften, Sopadeinformationsdienst, Vorstand der Sozialdemokratischen Partei Deutschlands, Bonn* No. 58, 1955. pp. 52. [G.]

A critical account, based partly on official figures and partly on other information, on forestry organization, including expropriation, land reform, collectivization etc., administration and practice, with particular emphasis on the destructive over-exploitation necessitated by official targets and aggravated by muddle and lack of expert personnel. Though official policy now prohibits clear fellings of > 1 ha., targets are stated to be incapable of fulfilment without these or equally destructive selection fellings. Tending and reforestation, the latter insufficient even according to official figures, are stated to be largely 'on paper'. Special chapters are devoted to labour conditions.

3508. ELSÄSSER, A. Die Forstwirtschaft in der Steiermark. **[Forestry in Styria.]** *Öst. Vjschr. Forstw.* 96 (4), 1955 (251–63). [G.]

A lecture giving data on the distribution and ownership of forests in this, the most extensively wooded Austrian province, and on its forest service, and discussing problems such as forest pastures—more tractable since recent changes in agricultural practice, e.g. mechanization—forest litter removal, game overstocking, policy regarding clear fellings etc.

3509. CREA, G. L'Aspromonte ed i suoi boschi. **[Aspromonte and its forests.]** *Monti e Boschi* 7 (2), 1956 (69–79). [It.]

An account of the Aspromonte region at the extreme tip of Calabria, and its principal forest types—*Lauretum, Castanetum, Fagetum, Leccetum, Quercetum* and *Pinetum.*

3510. TURNER, L. M. **Observations on the Caspian forest in Iran.** Utah State Agricultural College. [1955.] pp. 9.

A brief description of the geography, physiography, climate, soils, species, forest zones, products, range use, and fauna of the Beech/Maple/Oak forest between the Caspian Sea and the Elburz mountains.

3511. MÉTRO, A. Compte rendu de la session de Téhéran (Sept.–Oct. 1955) de la Commission forestière du Proche-Orient et de son voyage d'étude en Mazandéran. **[Report on the Teheran session (1955) of the Near East Forestry Commission and its study tour in the Caspian forests.]** *Rev. for. franç.* 8 (1), 1956 (45–59 + 4 photos + 5 gphs. + 1 map). [F.]

Gives a fairly detailed account of these forests.

3512. SAMAPUDDHI, K. **The forests of Thailand and forestry programs.** [*Bulletin*] *Royal Forest Department, Ministry of Agriculture, Bangkok* No. *R.*20, 1955. pp. 34 + 8 photos. 8 refs.

3513. STEIN, A. H. **Chile and its forests.** *Sylva, Edinb.* No. 35, 1955 (5–11 + 5 photos).

3514. AUBRÉVILLE, A. Le Venezuela forestier. **[Forests and forestry in Venezuela.]** *Bois For. Trop.* No. 45, 1956 (3–14). [F.]

3515. SMYTHIES, B. E. **Forests and forestry in Brunei.** *Malay. Forester* 19 (1), 1956 (19–24 + 4 photos).

3516. RAKOEN, M. P. Beberapa pendapat mengenai daerah hutan Bengkalis/Kampar. **[The**

forests of the Bengkalis/Kampar forest district [Sumatra].] *Rimba Indonesia* 4 (6/8), 1955 (223–48). 4 refs. [Jav.e.]

The 4 forest types are tidal, Nibung (*Oncosperma filamentosum*), swamp and dry-land. (1) Tidal forests produce chiefly charcoal, firewood, tanbark and pitprops. Total area before the war was about 26,330 ha., about 5000 ha. being used for producing tanbark and pitprops, the rest for charcoal and timber. The felling system should be strip selection felling, leaving about 64 standards/ha., and working plans should be prepared. (2) Nibung forests are used for producing poles for fish traps for sea fishing near Bagansiapiapi. About 50,000 poles are needed annually, and these could be provided by 2000 ha. if management and maintenance were improved. Survey and inventory of the forests, research on regeneration and the establishment of sample plots for research on productivity and suitable rotations are recommended. (3) Swamp forests are the most important in the district, comprising 333,970 ha. of exploitable forest with an annual increment of 200,000 cu.m. In view of recent over-exploitation, the following measures are recommended: surveys and inventories, research on natural regeneration, length of rotation and increment, and the establishment of reserves. (4) Exploitation of dry-land forests, containing many valuable species, is not urgent, owing to their inaccessibility. *From author's summary.*

905. Forest Statistics and Resources

See also No. 2635.

3517. ALGVERE, K. V. Det skogsindustriella läget inom Sovjetunionen: en utredning på basis av den ryska skogliga litteraturen och fackpressen. **[The position of the forest industries in the Soviet Union: a report based on Russian forestry literature and the technical press.]** Svenska Trävaruexportföreningen [Stockholm?]. 1955. pp. 143 + many photos + 1 gph. + 16 maps. 55 refs. [Sw.]

Section I consists of general information on forest industries and supplies of wood: Section II gives a more detailed account of forest resources, communications, forest industries, exploitation etc., for the 5 forest regions North Russia and Karelia, Ural, W. Siberia, East Siberia and the Far East.

3518. Domänverket 1954: Kungl. Domänstyrelsen. **[Work in the State Forests, 1954, by the Royal State Forestry Board.]** *Sveriges Officiella Statistik: Skogshushållning.* Kungl. Boktryckeriet P. A. Norstedt and Söner, Stockholm. 1955. pp. xi + 143. [Sw.e.]

3519. **Indian forest statistics 1950–51 and 1951–52.** Manager of Publications, Delhi. No. 29, 1955. pp. 192.

Tabulated statistics, by states, on forest area, causes of fire, survey operations, forest settlements, demarcation, working plans, regeneration and afforestation, standing volume in exploitable forests, outturn of timber, firewood, and minor forest products, labour, revenue and expenditure, imports and exports, expenditure on communications and buildings, grazing in state forests etc.

3520. **Indian forest statistics 1952–53. Volume 1 (summary tables).** Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India. 1955. pp. 20.

Includes the following tables: (1) General forest statistics for all India; (2) the following by states: classification of forest area; outturn of timber and firewood; outturn of minor forest products; revenue, expenditure and surplus; (3) imports and exports of (*a*) wood and timber, (*b*) minor forest products, (*c*) wood products.

3521. **Timber resource review.** U.S. Forest Service, Washington. Chapters 1–9, issued separately, 1955. pp. 129 + 70 + 76 + 69 + 86 + 32 + 60 + 13 + 45 + 141 + 43 + 57 + 116 + 15 + 76. Many refs.

This sixth general review of the timber resources of the U.S. by the Forest Service (the last previous one was made in 1945) was made in 1952. The present report is a preliminary draft, subject to revision. It consists of the following chapters (issued separately): (1) Summary of the review; (2) Domestic supply of forest land and timber; (3) Growth and utilization of domestic timber; (4) Factors affecting future supply and quality of domestic timber; (*A*) Forest protection against destructive agencies, (*B*) Condition of recently cutover lands, (*C*) Forest tree planting, (*D*) Ownership of forest land and timber, (*E*) Financial and economic factors, (*F*) Forestry assistance programmes; (5) Some factors influencing past consumption of timber products; (6) Future domestic requirements for timber; (7) Future supply and quality of domestic timber; (8) Timber resources of North America and the world; (9) Appendices: (*A*) Summary of basic statistics, (*B*) Definition of terms, (*C*) Converting factors, (*D*) Sampling standards, (*E*) Criteria for rating productivity of recently cutover lands.

3522. **The timber resource in Maryland.** Northeastern Forest Experiment Station, Upper Derby, Pa. 1955. pp. v + 41.

A report on the findings of the forest survey, showing area and condition of forest land, volume and quality of standing timber, rate of timber growth and mortality, and extent of felling for different forest products.

3523. PEDRO VEILLON, J. Geografia, composición, importancia y costo de las explotaciones madereras en el estado Barinas, Venezuela. **[Species, location, extent and costs of timber exploited in the state of Barinas, Venezuela.]** *Bol. Ingen. for. Univ. Los Andes* 2 (9), 1955 (71–124). 2 refs. [Span.]

Describes the methods used in estimating volumes, the species exploited, and their quantity and sources, presents data on ownership, costs of exportation and transport of timber in the round and the costs of transport of sawn timber to centres of consumption, and finally discusses the value of the sawn timber.

906. Direct Economic Significance of Forests (Position of Forests and Forestry in the National Economy)

See also No. 3174.

3524. DEFFONTAINES, P. Le rôle de la forêt dans la géographie humaine de l'hiver au Canada. **[The role of the forest in the human geography of winter in Canada.]** *Rev. for. franç.* 8 (3), 1956 (153–60 + 5 photos). [F.]

Explains the importance of the forest in affording occupations during the 5–6 months of winter in Eastern Canada when agriculture is at a standstill (logging, hunting, Maple-sugar harvest).

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116.

3525. MOREL, H. Y a-t-il des parcs nationaux en Grande-Bretagne? **[Are there any National Parks in Great Britain?** *Rev. for. franç.* 8 (3; 4), 1956 (189–204; 247–61 + 6 photos, 1 map). 32 refs. [F.]

An account of the progress made in the establishment of National Parks.

3526. EDWARDSON, T. E. **Amenity and forestry. (A commentary on the excursion of the Society of Foresters to the Lake District, 16–20 May 1955.)** *Forestry* 29 (1), 1956 (44–52 + 2 plates).

An attempt is made to classify the groups of opinion likely to be opposed to commercial forestry in Britain and to identify their particular interests in the matter. The suitability of the Lake District for a demonstration to foresters of the problems arising in the reconciliation of forestry and amenity is considered, and an account is given of Lakeland forests visited, and of the subsequent discussions by the Society members of the lessons to be learned for the future. In an appendix an extract is presented to a Grisedale Working Plan for a system of management by group-selection which was frequently mentioned in the demonstrations as one of the main hopes for reducing criticism and even arousing admiration in future afforestation work. *Author's summary.*

3527. VERSTEEGH, F. Algemene richtlinie voor het beheer der schermbossen in Indonesie. **[General lines for the management of protection forest in Indonesia.]** *Rimba Indonesia* 4 (9/12), 1955 (481–90). [Du.du.e.]

The irregular shelterwood system is recommended for forests 1000 m. above sea level; this would make them productive without increasing the risk of erosion or diminishing their hydrological value. Conversion to short-rotation crops, e.g. of *Acacia decurrens, Pinus merkusii* or *Agathis loranthifolia* should be avoided.

91. Land Use, Land-Use Policy (Including Afforestation Policy)

See also Nos. 2371, 2417, 2628, 2805, 3140, 3526, 3551.

3528. EDELMAN, C. H., and EEUWENS, B. E. P. **Bibliography on land and water utilization and conservation in Europe.** FAO, Rome. No. *FAO/55/11/7708*, 1955. pp. 347.

Arranged under the following heads: general and agricultural geography and maps; climate; soils; vegetation; hydrology and hydrography; land reclamation, drainage, irrigation, consolidation of holdings; soil erosion and soil conservation. There are no indexes.

3529. COENE, R. DE. **Agricultural settlement schemes in the Belgian Congo.** *Trop. Agriculture, Trin.* 33 (1), 1956 (1–12). 10 refs.

Describes the political, social, economic and agricultural bases of 'corridor' systems of regulated shifting cultivation in high forest and savanna, with their advantages and disadvantages. Crops, rotations, lengths of fallow and labour requirements are covered.

3530. WAIBEL, L. [revised by PFEIFFER, G.] Die europäische Kolonisation Südbrasiliens. **[European colonization in S. Brazil.]** *Colloquium Geographicum, Bonn* Vol. 4, 1955. pp. 152 + 25 photos. 5 pp. of refs. [G.]

Contains an account of the geography and natural resources, and sections on colonization since the 17th century in forest (including accounts of shifting cultivation), grassland, and the transition zone between the two.

3531. HUECK, K. Urlandschaft, Raublandschaft und Kulturlandschaft in der Provinz Tucumán im nordwestlichen Argentinien. **[Original landscape, landscape as degraded by destructive exploitation, and cultivated landscape in Tucumán Province, N.W. Argentina.]** *Bonner Geographische Abhandlungen, Bonn* No. 10, 1953. pp. 102 + 2 vegetation maps. 40 refs. [G.]

Covers, in greater detail, substantially the same ground as an earlier paper [cf. *For. Abstr.* 17 (No. 271)] but includes non-forest vegetation, both natural and cultivated, and lays greater stress on the human influences e.g. past and current practices of forest exploitation, pasture and clearing, with some statistical data and a list of native names of forest species.

92. Forest Ownership and Ownership Policy

See also Nos. 2632, 3148–50, 3540.

3532. KING, A. J. **Municipal forestry.** *Quart. J. For.* 50 (1), 1956 (43–7).

The work of a Head Forester under a large County Borough is described.

3533. RAUCHENBERGER, K. Probleme der Bauernwaldförderung. Erfahrungen aus Bayern. **[Problems in furthering peasant forestry. Bavarian experience.]** *Öst. Vjschr. Forstw.* 96 (4), 1955 (243–51). [G.]

An account of the situation in Bavaria, both on the departmental and the small owners' side (including village forests) at various levels. Stress is laid on the right psychological approach and on consultation and education, particularly through model forests, of which there are now 477 in the country, amounting to 5700 ha.

3534. La petite forêt: Suisse. **[Small woods: Switzerland.]** [*Docum.*] *8th Sess. FAO European For. Comm., Rome 1955*, No. *FAO/EFC/84–O*, 1955. pp. 8. [F.] Limited distribution.

3535. MIGNERY, A. L. **Factors affecting small-woodland management in Nacogdoches County, Texas.** *J. For.* 54 (2), 1956 (102–5). [Southern Forest Experiment Station.]

93. Public Supervision and Regulation of Forestry, Including Legislation for these Purposes

See also Nos. 3506, 3540.

3536. La ley forestal de suelos y aguas. **[The law relating to forests, soils and waters.]** *Agric. venez.* 20 (182), 1955 (28–33, 46). [Span.]

Presents the text of the new Venezuelan law of Aug. 1955, relating to protection, administration and exploitation of the forests, grazing, fines, reforestation, soil conservation, use of water, and penalties.

3537. LAMPRECHT, H. Unos apuntes sobre el principio del rendimiento sostenido en la Ley Forestal y de Aguas de Venezuela. **[The principle of sustained yield in the Venezuelan forest law.]** *Bol. Ingen. for. Univ. Los Andes* 3 (10), 1956 (9–34). 7 refs. [Span.]

In order to ensure sustained yield from all species, Article 94 of the Venezuelan Forest Law forbids the felling of trees below specified diameter. For this purpose trees are grouped into utilization categories, and a minimum felling diameter at a height of 1·2 m. is set for each group. To demonstrate the fallacy of the assumption underlying this regulation the author presents data collected in two types of Venezuelan forest; (1) high mountain cloud forest [cf. *For. Abstr.* 15 (No. 3412)], and (2) tropophyte forest (dry tropical forest according to Holdridge's classification). In both types, 3 groups of species can be distinguished: (*a*) appear in all diameter classes with regular distribution, (*b*) occur only in the lower diameter classes, usually in the understorey, and usually with a regular diameter distribution, and (*c*) are present in all diameter classes, but with irregular distribution. Data are also presented on the occurrence and diameter distribution of some frequently exploited Venezuelan species, viz. *Swietenia candollei, Cedrela mexicana, C. fissilis, C. montana, Bombacopsis sepium, Anacardium excelsum, Podocarpus respigliosii, Pouteria* sp. and *Terminalia* sp. In all these species the existing law either prevents adequate restocking or threatens their complete disappearance. If the required results are to be obtained by such practices there must be a regular distribution of all species in all diameter classes, the number of individuals decreasing regularly with increasing diameter. The law takes no account of the fact that species composition in these types of forest depends largely on the light requirements for regeneration of individual species, and that age, and not size, regulates the death and disappearance of mature trees. For the groups of species having a regular diameter distribution, a minimum felling diameter must be fixed for individual species and not for utilization categories. With regard to the group having irregular diameter distribution (which includes most of the more valuable timber species of Venezuela) the law cannot be successfully applied, in fact it threatens their extinction.

3538. HASEL. Kahlhiebsbeschränkungen in der deutschen Forstgesetzgebung. **[Restrictions on clear felling in German forest law.]** *Forst- u. Holzw.* 10 (12), 1955 (239–43). 7 refs. [G.g.]

Discusses the desirability and most suitable form of restrictions, the provisions of the Federal Law against Forest Destruction, and the state laws of Baden, Schleswig-Holstein, Nordrhein-Westfalen, Rheinland-Pfalz, and others.

94. Other Methods to Implement Forest Policy

See also No. 3533.

3539. KLOSE. Forstpolitik auf neuen Wegen. **[New departures in forest policy.]** *Forst- u. Holzw.* 10 (23), 1955 (477–80). [G.]

A short account of schemes—chiefly special levies and tax reliefs—by which funds for the intensification of forestry are provided in France, Norway, Switzerland and Sweden.

944. Co-operation. Collaboration of Forest Owners

See also No. 2367.

3540. MANTEL, K. Inhalt und rechtliche Form der forstlichen Zusammenschlüsse. **[Associations of forest owners, their legal structure, and what they are.]** *Forst- u. Holzw.* 10 (7), 1955 (131–5). [G.]

A general survey of their set-up and the legal and administrative framework, distinguishing administrative and managerial points of view, e.g. the vesting of the property, voluntary or compulsory formations, degree of state supervision, degree of joint management etc. [Cf. *For. Abstr.* 17 (No. 1098).]

3541. Gegenseitigkeitshilfe der Forstwirtschaft. Sieben Referate. **[Mutual aid in forestry. Seven papers.]** *Schriften des deutschen Forstwirtschaftsrates, Rheinbach bei Bonn.* 1954. pp. 58. [G.]

Foresters from various parts of Germany discuss the machinery, groupings etc., existing or desirable for the joint performance of tasks, such as soil improvement, afforestation, road-building, beyond the resources of small individual or communal proprietors, including channels for state aid, voluntary or compulsory owner levies (the latter deprecated) etc.

945.1. Advisory and Information Services, Documentation Centres

3542. Der Deutsche Forstwirtschaftsrat, 1950–1953. Bericht über die Tätigkeit der ersten drei Jahre. **[The German Council of Forestry, 1950–53. Report on the first three years.]** *Schriften des Deutschen Forstwirtschaftsrates, Hann. Münden.* 1953. pp. 184 + 23. [G.]

Includes a list of officers and members of the Council (a revival of a pre-Third Reich organization) consisting of representatives of forest owners, forest departments, staff and workers' associations, research etc., and its sub-committees (marketing,

small holdings, taxation, law and policy). Its functions were chiefly advisory.

945.3. Education. Training

See also No. 3504.

3543. **Starting a school forest.** H.M. Forestry Commission, London. 1955. pp. 12.

Gives a short account of a scheme by which schools can 'adopt' a plot in a Forestry Commission forest, and describes what has already been done by Cymmer Afan Secondary Modern School, Glamorgan on a plot in Coed Morgannwg.

945.4. Research

See also Nos. 2466–7, 2635–6, 3160, 3170, 3548.

3544. **Directory of current woodlands research and experimental work in the Canadian pulp and paper industry.** Pulp and Paper Research Institute of Canada, Montreal. 1955. pp. 247.

A new edition [cf. *For. Abstr.* 16 (No. 3697)] now issued in two parts, (1) research directed by the industry (this part), and (2) research directed by the Universities [see next abstract]. Included here are 238 investigations, now classified under a simplified Oxford Decimal arrangement, in loose-leaf form.

3545. **Directory of current woodlands research and experimental work in Canadian Universities.** Pulp and Paper Research Institute of Canada, Montreal. 1955. pp. 69.

A new, companion directory to that for the Canadian Pulp and Paper Industry [see preceding abstract], similarly arranged and containing 59 investigations.

3546. KER, J. W., and SMITH, J. H. G. **The need for co-operation and co-ordination in forest research.** *B.C. Lumberm.* 40 (1), 1956 (80–1). [University of British Columbia.]

A plea for a committee, with government, industry, and university members, to advise on growth and yield procedures, and make recommendations for: the allocation of, responsibility for, and the area within which to concentrate, field research; standardization of field and office procedure; approved methods of enumeration; yield tables; and standards of accuracy and calculation of the error of the estimate in enumerations.

946.2. Conferences

See also Nos. 2466, 3171, 3362.

3547. 1º Congresso Florestal Brasileiro. [**[Report of] the first Brazilian forest congress.**] *An. bras. Econ. flor., Inst. nac. Pinho* No. 6, 1953 (87–126). [Port.e.]

3548. **[Papers read at the final congress of the Vereniging van Hogere Ambtenaren bij het Boswezen in Indonesië, Bogor, 1954.]** *Tectona* 43 (3), 1955 (265–359). [Du. or E.e.]

All the following papers are in Dutch except that by G. Hellinga, which is in English: Some desiderata for forest research and policy in Indonesia (*F. K. M. Steup*); Tendencies in world silviculture and their influence in Indonesia (*E. J. van Alphen de Veer*); Methods of ground inventory in tropical virgin forests (*H. W. Schut*); Sawmills in Indonesia (*J. C. Hulsinga*); Some suggestions for plywood research in Indonesia (*H. J. van der Slooten*); Leguminous plants in forestry; some experiences in combination with a study of literature (*G. Hellinga*); some reflections on the Aek na Uli Pine [*P. merkusii*] complex (*K. Paijmans*); Significance and need of forest hydrological research in Indonesia (*F. Versteegh*).

95. Forest Taxation

3549. SELIN, L. **Forest taxation in Finland.** *Finnish Paper and Timber, Helsinki* 6 (10), 1955 (135–7). [E.]

Discusses the principles of tax assessment for forest land. The main factors include: area of forest enterprise and its distribution into site types (based on Cajander's forest types): average yield figures for 9 taxation districts; current prices; and local variations in stumpage. Discusses the advantages and disadvantages of the system.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See also No. 3524.

3550. WEIGER, E. Die Arbeiterfrage in der deutschen Forstwirtschaft. **[The labour problem in German forestry.]** Buchdruckerei Gotteswinter, München. 2nd ed. (rev.) 1954. pp. xxiv + 396. 96 refs. [G.]

The work, which is based chiefly on Bavarian conditions, deals with the development of permanent labour forces, comparative wage levels in industry and agriculture, wage systems, tariffs, work science, work organization and tools including mechanization, workers' welfare, training, recruiting and trade unions; and includes statistics, a Bavarian piece-rate tariff etc., all topics being brought up to date.

3551. SUOMINEN, O. Metsätyömieskylät ehdotus vakinaisten metsätyömiesperheiden asuntokysymyksen järjestelyksi. **[Forest villages, a programme for the solution of the housing problem of full-time forest worker families.]** *Silva fenn.* No. 86, 1955. pp. 35 + 1 map. [Fi.g.]

Discusses the points considered in a plan drawn up by the Finnish Forestry Administration as a means of overcoming the constantly increasing labour shortage, e.g. siting, size of holdings, tenure etc. The plan is at present restricted to large continuous areas of state forests; ca. 800,000 ha. in East Finland and in North and East Bothnia are to be served by 28 new villages for 1035 families. *From author's summary.*

97. International Forest Policy and Other International Collaboration

971. Congresses. Conferences

See also No. 2816.

3552. Informe final, V reunión de la Comisión Forestal Latinoamericana. **[Final report, 5th meeting of the Latin American Forestry Commission.]** FAO, Caracas. No. *FAO/LAFC*-55/41 Rev., 1955. pp. 50. [Span.]

FORESTRY THE WORLD OVER

References: 1. *Chêne-Liège*, Constantine; 2. *Holz-Zentralblatt*, Stuttgart; 3. *Lumberman*, Seattle; 4. *Nature*, London; 5. *New Commonwealth*, London; 6. *Oxford Mail*, Oxford; 7. *Report on Forest Administration Nigeria*, Lagos; 8. *Science*, Washington; 9. *Science for the Farmer*, University Park, Pa.; 10. *Southern Lumberman*, Nashville, Tennessee; 11. *Timber Trades Journal*, London; 12. *World Crops*, London.

International.

FAO. The FAO Forestry Division is preparing a Saw Directory in French, English, and Spanish, which will include saws (circular, band, and gang) used for primary breakdown of logs, but not bench-, rip-, or re-saws.

Conferences 1957.

19–24 March. UNESCO. Preparatory meeting of experts in humid tropics research and symposium on methods of study of tropical vegetation. Ceylon

Australia. Ralph Symonds Ltd. of Sydney, already producing "Giant Reswood" fully waterproof-bonded sheets of plywood 25 × 7 ft., have under design for construction a press enabling them to make sheets 50 × 9½ ft. thereby more than doubling the size of the sheet, which itself is stated to be the largest produced. Export orders have already been received for the larger sheets, which have the special advantage of reducing labour costs in concrete shuttering, railway wagons, flooring, roofing, boatbuilding, garages and large caravans (**11**; 3.5.56).

Canada. Comparison of growth rings of a piece of Willow (*Salix arctica* s.l.) wood, found on an ice island, with those of Willows on Ward Hunt Island, Ellesmere, in the extreme north of Canada, suggests that the tree was still growing on land in summer 1935, and that the ice island broke away between then and 1947, when it was observed from land (**8**; Dec. 1955).

Great Britain. A stone has been set up in Eggesford Forest, bearing the following inscription: "This stone, unveiled by Her Majesty Queen Elizabeth II on 8th May, 1956, commemorates the planting by the Forestry Commission of one million acres in Great Britain. The Commission's first trees were planted on 8th December 1919 in Eggesford Forest, Devon." Forestry Commission plantations now form 500 forests, distributed over most of the counties of Great Britain (**11**; 5.5.56).

The Timber Development Association is inviting some 20–30 timber-using industries to participate in a consultative Timber Industries Council, the objects of which are to define the problems needing investigation, to make available technical help and advice from the timber-using industries, to publicize the results of research, and to maintain contact, at the technical level, between timber producers and consumers (**11**; 26.5.56).

The Mersey Docks and Harbour Board, rebuilding a shed 500 yards long, destroyed by enemy action, have accepted a T.D.A. mansard-roof-truss design which will support the 80-ft. span at 15-ft. centres. The truss members (Douglas Fir from British Columbia) are joined with 2½-in. split-ring connectors, and full-scale tests on 3 trusses have proved successful. Timber was accepted in preference to steel on the grounds of cheaper first cost and maintenance, advances in timber construction technique, and greater safety in the event of fire. War-time fire-fighters' experience was that timber roofs, despite extensive charring, usually do not collapse so early as metal roof components, and when they do collapse, do so without pulling walls down (**11**; 7.4.56).

India. It is calculated that only 28% of India's fuel consumption is coal, 5·6% is oil and electricity, 32% cattle dung, and 34% wood, dried leaves and twigs (**4**; 19.5.56).

Morocco. As a result of the assassination of a district forest officer, the authorities have decided to abandon isolated and exposed forest posts. This involves some 500 foresters of the Administration des Eaux et Forêts, and some 5000 Moroccans employed on afforestation and soil conservation work (**1**; 2.5.56).

New Zealand. About 7600 acres of Corsican Pine plantations approaching maturity have been killed by a fire in Canterbury Province. The fire, which is believed to have been caused by an electrical fault in a forest vehicle, was driven by a N.W. wind with gusts of 75 m.p.h. and burnt mainly in the crowns. It is hoped to salvage much of the timber, and mills are being set up in the area to start work at once (**5**; 9.1.56).

Nigeria. Increasing costs and dwindling man-power resources have necessitated a modification of the original Tropical Shelterwood System. The main change is the greater emphasis laid on the initial operation of climber cutting, which has proved more effective than was expected in inducing regeneration; regeneration counts are to be confined to 12½% of the total area and to economic species of 14 genera. The Tropical Shelterwood System is now applied to 124,498 acres in the Western Region of Nigeria and over the greater part of this area has been successful in establishing young crops capable of developing into forests incomparably more productive of useful timber than the original natural growth. The changes in the system are only minor ones dictated chiefly by practical considerations of labour and supervision (**7**; 1955).

North Borneo. The numerous "small-holders" (independent, free-lance bodies) in the timber industry, who produce and export a considerable proportion of the timber from N. Borneo, are apprehensive of the effects of the Government's new policy for the timber industry, which will have the effect of excluding them from direct access to overseas markets and force them to sell to local purchasers, including the big timber companies. At present many small-holders who export their timber themselves are able to get good prices in overseas markets (**5**; 23.1.56).

Seychelles. The Double Coconut Palm, *Lodoicea seychellarum*, whose fruit is one of the largest known and takes 10 years to ripen, is threatened with extinction and has been placed under protection in certain parts of the Seychelles (**2**; 17.3.56).

Sweden. The first large-scale international exhibition of forest machinery was held at Stockholm in April 1956. Some 2000 exhibits from 10 countries were on view, including lorries and tractors of all sizes, winches and loading devices, 30 makes of chain saws, mobile barking machines, a current-maker to prevent formation of ice, and a device for promoting thickening of ice (**11**; 26.5.56).

U.S.A. Research in which radioactive isotopes were used has shown that rain can wash nutrients out of plant foliage as well as out of the soil [cf. *For. Abstr.* 13 (No. 1976)]. At Michigan State University 71% of the K in plant leaves was washed out by 4 hours of simulated rainfall. It was also shown that N, Ca, Mg, Mn, B, Fe, and Cu may be washed out by rain. These results throw some doubt on some South African experimental work of a few years ago [cf. *For. Abstr.* 14 (No. 1886)], which indicated that mineral nutrients were absorbed through foliage from the air, from clouds of aerosol particles. In these experiments, absorptive papers hung from trees in leaf-like positions showed a gain in mineral nutrients. In order to show measureable gains, however, these papers had to be exposed for long periods, and it now seems more probable that the nutrients they acquired came from rainfall "washings" from adjacent leaves (**12**; May 1956).

A new ultrasonic method of testing wood without damage to its structure employs electronic impulses that are converted into sound waves. These, after penetrating the wood, are relayed to the cathode-ray tube of an electronic receiver. Imperfections, such as knots, splits, etc., appear on a visual receiver panel as variations of a horizontal line denoting clear wood (**10**; 1.3.56).

The U.S. Navy has recently constructed several wooden minesweepers, in order to eliminate the magnetic field usually present about ships. All large structural parts were laminated (**9**; Winter 1955–6).

A new target for towing behind a plane, developed by technicians at the Naval Ordnance Test Station, Inyokern, Calif., is of Fir plywood. It is 14 ft. long with fins 4 ft. wide (**3**; 25.3.56).

Large plywood barrels made of a single sheet of plywood plus top and bottom, which can be packed flat for storage, assembled without nails or bolts, and used up to 100 times, are being produced by the Gay-Bell Corporation of Paris, Kentucky. They are said to withstand pressures of up to 12½ tons during mechanical packing (**12**; March 1956).

A stroke sander said to be the longest in the world is used by a church-furniture plant to sand pews 21 ft. long. In spite of the 21 ft. working length, the operator operates the machine with convenient controls mounted in the centre, on top of the upper cross-beam (**10**; 15.5.56).

Two Florida chemists report that mushrooms can be grown cheaply and abundantly on sawdust with a little oatmeal added, and suggest that commercial adoption of the method would provide a use for some of the sawdust now wasted (**6**; 11.4.56).

U.S.S.R. In the sixth Soviet plan (1956–60) the priorities are heavy industry, technology, and productivity, with timber occupying an important place. The 1960 targets in millions of cu.m. (% increases on 1955 production in brackets) are: haulage of marketable timber 264 (134); sawn timber 80 (138). Additional haulage and sawmilling capacity for 82 and 16·5 million cu.m. respectively will be required. Measures to achieve this include: the conversion of logging from a seasonal to a year-round basis, manned by a permanent cadre; all-round improvement in equipment, mechanization, automation and machinery; transfer of initial log conversion from the cutting area to roadside dumps where it will be mechanized; provision of electric power from wood waste to the cutting areas; use of trailer and heavy cross-country lorries; further development of the North, the Urals, the Karelo-Finnish Republic, and Siberia in both logging and sawmilling; and the construction of railways Achinsk-Abalakovo and Mikum-Koslan (**11**; 18.2.56).